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Volatile Organic Compound Emissions from Solvent Cleaning Operations in the State of Illinois

GCA Corp.
Bedford, MA

Prepared for

Environmental Protection Agency
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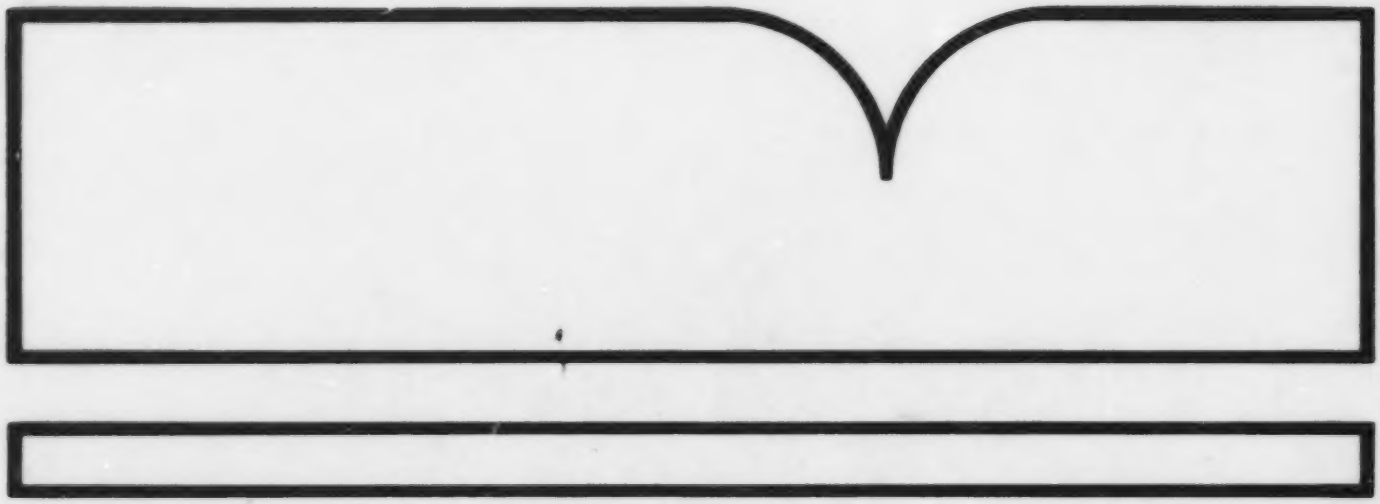

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Volatile Organic Compound Emissions From Solvent Cleaning Operations in the State of Illinois

by

GCA Corporation
Technology Division
213 Burlington Road
Bedford, Massachusetts 01730

Contract No. 68-02-3510
Work Assignment 1

Prepared for:

U.S. Environmental Protection Agency
Region V
Air and Hazardous Materials Division
Air Programs Branch
Chicago, Illinois 60604

EPA Project Officer: Barry A. Perlmutter

January 1981

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ABSTRACT

This report provides data on solvent cleaning equipment and emissions for nine counties in two urban oxidant nonattainment areas near Chicago and East St. Louis, Illinois. A telephone survey of over 500 facilities in 12 SIC categories was performed in a representative sample area to obtain data that was projected to the nine counties. The purpose of this study is to provide sufficient data for a determination of equivalency between the presumptive norm of U.S. EPA's solvent metal cleaning CTG document and IEPA's Rule 205(K).

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SECTION 1

INTRODUCTION

Illinois Rule 205(K)(1)(A) exempts from control solvent cleaners which emit less than 15 lb/day or 3 lb/hr of volatile organic compounds (VOC). The technical basis for this rule, according to the Illinois Environmental Protection Agency (IEPA), was taken from U.S. EPA guidance, EPA 905/2-78-001 (Regulatory Guidance for Control of VOC Emissions from 15 Categories of Stationary Sources). The guidance states, in part, that "these regulations will not apply to sources whose emissions of VOC are not more than 6.8 kg (15 lb) in any 1 day, nor more than 1.4 kg (3 lb) in any 1 hour."

A U.S. EPA proposed action in the Federal Register, 44 FR 38587, states that: "Although the State indicates that its proposed rule is more restrictive than the Control Technique Guideline (CTG) recommendation, data to justify this position are not included within the SIP nor in the technical support document. U.S. EPA proposes to approve this provision conditioned upon a showing by the State that their proposal is indeed more restrictive than the technically supported RACT in the CTG. Alternatively, U.S. EPA will accept a showing that the allowable emissions resulting from the State's proposal are within 5 percent of the emissions which would result from the adoption of the control requirements technically supported in the CTG."

The rationale for stating that Rule 205(K) was more restrictive, according to IEPA, was based on IEPA permits as well as on sales information furnished by the major suppliers of halogenated degreasing solvents. IEPA estimates that Rule 205(K) will subject to control at least 1000 tons of VOC emissions which would be exempted under the CTG definition.

An independent estimate made by Booz Allen Hamilton for Region V - U.S. EPA indicated 77,900 cold cleaners in Illinois as opposed to IEPA's estimate of 170,000. The Booz Allen estimate was obtained by multiplying the number of number of estimated cold cleaners in the U.S. by the ratio of plants expected to use cold cleaning in Illinois to that of the U.S.

The primary purposes of this study are to: (1) resolve the discrepancies regarding the actual number of cold cleaners operating in two urban nonattainment areas of Illinois (Chicago and East St. Louis) and the associated VOC emissions; (2) evaluate all solvent cleaning operations in the two study areas and the associated emissions and; (3) submit documentation sufficient for a determination of the equivalence of Rule 250(K) and EPA's determination of RACT for solvent metal cleaners.

Since there is estimated to be in excess of 70,000 pieces of solvent cleaning equipment in the nine counties which comprise the Chicago and East St. Louis urban nonattainment air quality control regions, GCA chose to survey a representative sample area and to project solvent cleaning emissions for the nine-county area on the basis of data collected in the sample area as well as existing data from several sources. The sources of existing data are described in the Data Collection section.

Analysis of the collected data projects emissions for each of 12 Standard Industrial Classification (SIC) codes and for each type of equipment within 8 of the SIC codes. Although data were collected from over 500 facilities, a breakdown of emissions by equipment type is not possible for four of the less populated SIC codes. In addition to actual emissions, allowable emissions under IEPA's Rule 205(K) and under the presumptive norm of the USEPA RACT CTG document are calculated for both poor and excellent compliance scenarios. The nine counties covered by this study are:

- Cook
- DuPage
- Kane
- Lake
- McHenry
- Will
- Madison
- Monroe
- St. Claire

Section 2 of this report addresses data collection procedures; including sources of data, identification of a sample population and performance of a telephone survey. Section 3 describes the data analysis procedures and provides the results of this study. Section 4 provides data validation and conclusions.

SECTION 2

DATA COLLECTION

SOURCES OF DATA

GCA identified several sources of local VOC emission data. IEPA's computerized permit system, TAS, was a good source of data for facilities with vapor cleaning equipment. IEPA provided a printout of degreasing sources on 2 October 1980. A hydrocarbon area source emission inventory for the nine counties covered by this study was performed by Walden Division of Abcor during 1977 and 1978. Three outputs from the Walden study were used. First, the "Final Report on Study of Area Source Hydrocarbon Emissions," provided the results of the Walden study. Second, the U.S. EPA Project Officer supplied about 300 completed questionnaires used in the Walden study. Third, IEPA officials provided a computer tape with data on 7000 facilities generated by Walden and submitted to IEPA.

IEPA also provided a computer listing of over 20,000 facilities based on a Dunn & Bradstreet computer listing. This printout provided the most complete listing of facilities used in this report. Other sources of data included a printout of sources provided by the City of Chicago, Department of Environmental Control, listings from local Chambers of Commerce and the telephone survey described later in this section.

IDENTIFICATION OF A SAMPLE POPULATION

The Walden questionnaires were distributed in a manner which is representative of all VOC sources in the nine counties. The questionnaires were reviewed to determine the geographical distribution of facilities with solvent cleaning operations. GCA's review of Walden's questionnaires indicated that more than 70 percent of facilities with solvent cleaning operations are located in Cook County. The Walden report found that about 77 percent of all VOC emitting facilities are located in Cook County. This indicates that the geographical distributions of solvent cleaning facilities and that of VOC emitting facilities is similar.

GCA's review of existing data also found several other factors which affect the choice of a representative survey area. First, no one county outside of Cook County contains facilities with a sufficient distribution of SIC codes to be a representative area. Second, calculations based on data in the Walden report show that less than 3 percent (169 of 7,026) of the VOC emitting facilities are located in the three counties in the East St. Louis area. Because the population size is so small, all facilities in the three counties would have to be surveyed to obtain accurate data.

A representative survey area in Cook County was tentatively chosen based on Walden questionnaire data. Facilities in SIC codes 34, 35 and 36 were used as indicators of representativeness. Unfortunately, the questionnaire data yielded only 6 facilities in SIC 34 and 10 facilities in SIC 35 that were in Cook County and had degreasing emissions. There were numerous facilities in SIC 36 with degreasing emissions and 10 facilities were found in the same ZIP code areas as SICs 34 and 35. The ZIP code areas were located on a map of the Chicago area and the following ZIP codes were chosen on a geographical basis:

- 60001 through 60009
- 60646, 60647, 60650, 60651.

The Illinois EPA, Division of Water Pollution Control computer printout of business establishments, based on a Dunn & Bradstreet computer listing, yielded over 650 facilities in the Chicago area (ZIP codes 60646, 60647, 60650, 60651) and over 675 facilities in the Arlington Heights area (ZIP codes 60001 through 60009). The Walden computer tapes yielded over 100 facilities in the Chicago area most of which had already been identified by the Dunn & Bradstreet listing.

GCA decided that either the Chicago area or the Arlington area could be surveyed, but a survey of both areas was beyond the scope of this study. We chose the Chicago area based on the slightly smaller number of facilities to be surveyed. As can be seen in Table 1, the number of facilities to be contracted eventually grew to over 700, as facilities in Arlington Heights and Morton Grove (60053) were contacted to broaden the data base in SIC categories 22, 25, 34, 35, 36 and 37. The data on facilities outside of the representative area are used to calculate or verify average emissions per facility data points.

TELEPHONE SURVEY OF FACILITIES

A telephone survey was conducted during the weeks of October 13 and 20. Lists of facilities in our representative survey area were generated from sources described above. All the facilities from the generated lists were called, along with known degreasing facilities from the Walden survey. This survey used the Illinois Solvent Cleaning form shown in Figure 1.

Table 1 shows the SIC codes which the Walden report indicate were likely to operate solvent cleaning equipment. Less than 50 of the calls attempted were outside the representative survey area. Those companies not contacted include: disconnected phone numbers, no answer, out of business, business moved out of ZIP code area and wrong telephone numbers. Facilities that refused to answer were included as completed questionnaires. Table 1 shows that, of the 504 facilities contacted, only 57 facilities or 11 percent refused to respond to the questions. The telephone survey produced 504 completed questionnaires of which 103 or 20 percent stated that degreasing equipment was operated at that facility.

TABLE 1. COMPLETED TELEPHONE SURVEY

SIC	Calls attempted	Company not contacted[a]	Completed questionnaire	Yes	No	Refused to answer
22	22	5	17	0	16	1
25	12	7	5	0	5	0
28	25	8	17	1	15	1
30	26	7	19	1	16	2
33	30	8	22	3	19	0
34	151	32	119	25	73	21
35	170	47	123	20	85	18
36	114	46	64	16	40	8
37	29	8	21	5	12	4
38	26	4	22	4	18	0
39	41	12	29	4	23	2
75	70	24	46	24	22	0
Total	716	208	504	103	344	57

[a]Facilities with disconnected phone numbers, out of business, no answer, business moved to another ZIP code area and wrong telephone numbers.

SURVEYING SIC 75

Solvent cleaning emissions from automobile repair facilities and gasoline service stations (SIC 75) were excluded from previous inventories. Therefore, a new data base had to be established through a telephone survey in our representative area. A listing was found in the 1980 Chicago yellow pages and about 70 facilities were identified in our ZIP code areas. GCA contacted 46 of those facilities, the others were either out of business or unwilling to give us information. This telephone survey provided us with new information on solvent cleaning usage in SIC 75 as well as the size and type of equipment.

ILLINOIS SOLVENT CLEANING SURVEY

COMPANY NAME: _____ TEL NO. _____

PLANT ADDRESS: _____

_____ CITY: _____ ZIP _____

MAILING ADDRESS: _____

CITY: _____ ZIP _____

PERSON CONTACTED: _____ TITLE: _____

NATURE OF BUSINESS: _____

NUMBER OF EMPLOYEES: _____ NEW SOURCE: YES: __ NO: __

SIC: _____

Do you operate solvent cleaning or degreasing equipment?

Are materials cleaned metal or non-metal?

How many pieces of cold cleaning equipment are used?

How many pieces of batch (open top) vapor cleaning equipment are used? Are openings <1.0 m^2?

How many pieces of conveyorized vapor cleaning equipment are used? Is air/vapor interface <2.0 m^2?

How many pieces of conveyorized cold cleaning equipment are used? Is air/vapor interface <2.0 m^2?

Figure 1. Illinois Solvent Cleaning form.

Type and amount of solvent used (Gal/Yr):

a) Stoddard:_____

b) 1,1,1-trichloro ethane (Chlorothene VG):_____

c) Perchloroethylene:_____

d) Methylene Chloride:_____

e) Trichloroethylene:_____

f) Other:_____

Mfg:_____

Density of Solvent:_____

Waste solvent disposal method (if more than one, estimate percent) (Gal/Yr):

a) Vapor recovery:_____

b) Incinerator:_____

c) Discharged to drain or sewage:_____

d) Carbon Adsorption:_____

e) Condenser:_____

f) Hauler:_____

g) Returned to supplier or collector:_____

h) Other (specify):_____

Operating schedule:_____ Hrs./Day_____ Day/Wk_____ Wk/Yr

Figure 1 (continued)

SECTION 3

DATA ANALYSIS

The data described in Section 2 was analyzed in detail by GCA. The Walden Report categorized industries under their own coding system; therefore, it was necessary for GCA to rearrange these codes into various SICs (see Table 2). In some cases an adding up of several Walden codes to obtain a complete SIC was necessary, while in other cases percentages of each code were taken based on Walden questionnaire results to determine the number of facilities and quantity of emissions within an SIC.

GCA examined the Walden questionnaires in order to determine the percentage of hydrocarbon emissions that are solvent cleaning emissions for each SIC. This was then applied to the total known hydrocarbon emissions for each county (obtained from Walden Report, Table 21), producing total solvent cleaning emissions. The number of facilities with solvent cleaning was determined in a similar manner. Based on the Walden survey, the number of facilities with solvent cleaning was divided by the number of facilities with hydrocarbon emissions in each SIC. This ratio was then applied to the total number of known facilities in each county to find the number of facilities with solvent cleaning emissions (see Table 3).

Data contained in the completed Illinois Solvent Cleaning forms were transferred to working tables summarizing all data for the sample area. Under the questionnaire column in Table 4, the letters identify updated Walden questionnaires and the numbers identify GCA survey forms.

The operating schedule, found in Table 4, was based on the amount of time that a particular piece of degreasing equipment was utilized, not on the work schedule of the shop or plant operation. In many instances the shop would operate their degreasing equipment on a batch feed schedule.

Many factors influence the amount of time that the equipment is running. The amount of product to be cleaned, the frequency of repairs and the frequency of solvent replacement were factors that GCA considered when estimating the operating schedule for each surveyed piece of equipment. GCA estimated operating schedules between 100 days/yr for small machine shops and 250 days/yr for large machine shops and manufacturing facilities. A further summary sheet was prepared showing the numbers of facilities contacted and the number with solvent cleaning operations by SIC code as shown in Table 5.

Separate working tables were prepared from GCA's survey of SIC 75 facilities. Table 6a provides the type, number of pieces, and size of solvent cleaning equipment used in each SIC 75 facility surveyed. Solvent emitted in gallons per year is based on the amount of solvent bought minus the estimated quantity hauled. The density of the solvent shown in Table 6b was used to convert solvent emissions to tons per year. The working tables show that there are 57 pieces or solvent cleaning equipment in 24 facilities or 2.4 pieces of equipment per facility. Table 7 provides the number of SIC 75 facilities in each county based on U.S. Bureau of Census, County Business Patterns, 1977 data. There are 24 of 46 facilities with solvent cleaning emissions in the survey or 52 percent of facilities operate solvent cleaning equipment. The 52 percent factor was applied to the total establishments in each county (Table 7) to obtain the facilities with emissions in Table 8. The number of pieces of equipment were calculated by using the survey average of 2.4 pieces of equipment per facility with solvent cleaning equipment. Emissions were calculated with the aid of the graph in Figure 2. The emissions per facility in a given size range (Table 9) times the number of facilities in that size range (Table 8) yields SIC 75 emissions in Table 9.

Table 10 shows the number of facilities in each county by SIC category. Table 11 shows the values GCA used to project the number of facilities with solvent cleaning equipment in each county and to project solvent cleaning emissions for each SIC category in each county. The following facility projection method was used, keeping in mind that Walden Division projected emissions only from facilities previously listed as sources of hydrcarbons, while GCA surveyed all of the facilities in 12 SIC categories in a sample area.

For each SIC category GCA found a different (usually larger) number of facilities than Walden Division in the sample area. The GCA number divided by the Walden number is identified as a facilities projection factor. This factor is used to project the number of additional facilities with solvent cleaning emissions to the county level. The percent of facilities with solvent cleaning emissions in each SIC code was calculated as follows:

$$\text{Percent of facilities with solvent cleaning equipment} = \frac{(FPF \times NFWSC) + WFWSC}{NFCC}$$

where: FPF - Facilities Projection Factor.

NFWSC - New Facilities with Solvent Cleaning Equipment in sample area.

WFWSC - Walden Facilities with Solvent Cleaning Equipment in Cook County.

NFCC - Number of Facilities in Cook County from Bureau of Census data.

An example is given for SIC 28.

From Table 5, Walden found 2 facilities in the sample area while GCA found 17; this yields a facility projection factor of 8.5. GCA found one new facility with solvent cleaning equipment in the sample area. Walden projected 64 facilities with solvent cleaning equipment in Cook County from Table 3. In Table 10, the number of SIC 28 facilities in Cook County is 484. The formula above yields the following:

$$\frac{(8.5 \times 1) + 64}{484} = 15\%$$

The 15 percent value appears in both Tables 11 and 12.

This formula was not used for SIC's 22, 25, and 39. In SIC 22 GCA found no facilities with solvent cleaning equipment out of the 17 facilities it contacted; however, one facility refused to answer GCA questions. Walden projected one facility with solvent cleaning emissions and only five facilities with hydrocarbon emissions in Cook County. The Bureau of Census counted 49 SIC 22 facilities in Cook County. The formula above yields 2 percent of Cook County facilities operating solvent cleaning equipment; however, if GCA had found one facility with solvent cleaning emissions in the sample area, the value would have been 8 percent. GCA chose five as a reasonable value for percent of facilities with solvent cleaning equipment.

In SIC 25 GCA found no new facilities in the sample area. For this reason GCA used Walden's estimate of approximately 40 percent of the facilities having solvent cleaning equipment.

In SIC 39 (Miscellaneous Manufacturing), Walden found 269 facilities of which 143 were projected to have solvent cleaning emissions. Bureau of Census found 159 SIC 39 facilities in Cook County. It appears that Walden and Bureau of Census defined "Miscellaneous" differently. Since Walden projected 53 percent on the basis of their survey and GCA predicts about 14 percent on the basis of its survey, it seems reasonable that the actual value should lie between these two values. The formula described above yields a value of 96 percent because of the difference between the Bureau of Census count of all facilities and Walden's projection. GCA assumed that 30 percent of the facilities have solvent cleaning emissions.

Table 11 also shows the average emissions per facility projection factors used by GCA. The first column, "Average Emissions Per Facility from Telephone Survey," was calculated directly from the telephone survey summary data in Table 4. This factor refers only to facilities with solvent cleaning equipment. The second column, "Average Emissions Per Facility from Walden Survey," was calculated from Walden questionnaires. These values are for comparison purposes only. GCA projected average emissions per facility using both of these data sources and the method described in the Preliminary Report for this study. (See Appendix A).

For SIC's 34, 35, 36, and 37, GCA first developed a size distribution of emissions per facility based on Walden questionnaire data. The top graph in Figures 3a through 3d show the results of this effort. The data in the Walden questionnaires were then updated and validated. The size distribution changed slightly as can be seen in the middle graph of Figures 3a through 3d. Finally, the data from new facilities found in the GCA telephone survey were added to the size distribution, resulting in the bottom graph in the figures and the average emission per facility estimate shown in Tables 11 and 12.

There was sufficient data available for SIC's 34, 35, 36, 37 and 75 to follow previously agreed upon procedures. (See Appendix A). For SIC's 22, 25, 28, 30, 33, 38 and 39 there was insufficient data points to develop a size distribution. The agreed upon procedures called for averaging the emissions from the surveyed facilities for these SIC categories. However, the large variability of emissions from these facilities caused serious problems. As can be seen in Table 11, SIC 30 had an average emission per facility of 0.3 tons/yr and SIC 39 had an average of 120 tons/yr. In addition, the telephone survey found no sources in SIC's 22 and 25.

Although there are seven SIC's for which emissions data are insufficient to accurately predict emissions per facility, less than 25 percent of the facilities projected to operate solvent cleaning equipment are in SIC categories 22, 25, 28, 30, 33, 38 and 39. GCA in conjunction with the EPA project officer determined that the best estimate of emissions per facility for these categories would be to average the emissions per facility projections for the categories with sufficient data. The average emissions of SIC categories 34, 35, 36, 37 and 75 is 11.8 tons/yr/facility. This emission projection was used for SIC categories 22, 25, 28, 33, 38 and 39. For SIC 30, the data from Walden Questionnaires and GCA telephone surveys was of lower variability (standard deviation 2.74) and lower emissions than for other SIC categories. GCA chose to use the 1.9 tons/yr as the average of the survey and questionnaire data for SIC 30.

Table 12 presents GCA's estimates of facilities operating solvent cleaning equipment and solvent cleaning emissions by SIC category and county. These estimates are based on the factors listed in the left hand columns of Table 12.

GCA's projection of the number of operating solvent cleaners by SIC and type of equipment within each county is shown in Table 13. These projections are based on the average number of pieces of equipment per facility, calculated from the working tables, times the number of facilities shown in Table 12. The number of U.S. EPA exempted pieces of equipment was calculated by finding the percent of equipment which cleaned non-metal products for each SIC. The number of IEPA exempt equipment was calculated by multiplying the percent of equipment emitting less than 15 lb/day or 3 lb/hr times the number of facilities shown in Table 12. Both the IEPA and U.S. EPA exempted equipment numbers were calculated separately for each type of equipment, although only the totals appear in Table 13.

Table 14 shows GCA's projections of solvent cleaning emissions by SIC category and type of equipment. To obtain these values within each SIC category, GCA calculated the percent each type of equipment contributed to the emissions for the sample area. These percentages were then applied to the emissions values in Table 12. The resulting values in the total column of Table 14 should be the same as the emission value found in Table 12.

In Table 15 GCA calculated the percent of each type of equipment which was exempt (not shown) and then multiplied times the actual emissions in Table 14. The percent of each type of equipment which was exempt was calculated from the working tables.

At this point both actual and exempt emissions data by type of equipment was available for a calculation of allowable emissions under IEPA Rule 205(K) and the CTG presumptive norm. Two sets of emission factors were found in AP-42 for each type of equipment (see Table 16). The relative volatility of the solvents was the criteria for cold cleaning equipment. Data from our working tables indicated that all of the solvents used had volatilities greater than 0.6 psig at 100°F therefore the values of 0.45 for poor compliance and 0.31 for excellent compliance were used as emission factors. The criteria for vapor cleaning equipment was the cross sectional area of the openings. Our survey data for open top vapor cleaning equipment indicated that some pieces of equipment were larger than 1.0 m^2 and some smaller than 1.0 m^2 in each SIC (see Table 17). Therefore a weighted average for each SIC would have to be applied based on the percentage of equipment in each category to obtain a corrected emission factor. For conveyorized vapor cleaning equipment, our data indicated that all pieces of equipment had openings smaller than 2.0 m^2, therefore the values of 0.80 for poor compliance and 0.70 for excellent compliance were used as emission factors. The corrected emission factors are shown in Table 18.

Allowable emissions are shown in Tables 19 through 22. The values in these tables were obtained by applying the following formula.

Allowable Emissions = CEF (Actual-Exempted) + Exempted

where: CEF is the corrected emission factor in Table 18.

Actual is the actual emissions in Table 14.

Exempted is the exempted emissions in Table 15.

Allowable emissions by type of equipment could not be calculated for SIC categories 22, 25, 28 and 30. The values in the total column of Tables 19 through 22 for these SIC categories reflect the average emission reduction for SIC categories 33, 34, 35, 36, 37, 38, 39 and 75 of each table.

Tables 23 and 24 summarize the results of GCA's data analysis. Table 23 provides Illinois exempt and major control device exempt equipment and emissions. Columns A and B of Table 23 are derived from Table 13 and 14, respectively. Columns C and D are derived from the working tables and Tables 13, 14 and 17. Columns E and F assume 100 percent of conveyerized degreaser equipment and emissions are major control device exempt, since the telephone

survey found no equipment with vapor opening greater than 2.0 m^2. Table 24 summarizes data in Tables 13 and 14. The number of metal cleaners and amount of metal cleaning emissions was obtained by subtracting non-metal cleaners (U.S. EPA exempt) from totals obtained from Tables 13 and 14.

A comparison of allowable emissions for the low and high emissions scenarios is presented in Table 25. The values in this table are obtained. from the total emissions for each county in Tables 19 through 22. Allowable emissions for each urban nonattainment area are totaled separately. The total emissions allowed by the CTG presumptive norm are compared to the total emissions allowed by Illinois Rule 205(K) on a percentage of the difference basis. The following formula was used:

$$\text{Percent Difference} = \frac{\text{IEPA Allowed Emissions} - \text{CTG Allowed Emissions}}{\text{CTG Allowed Emissions}} \times 100$$

The Percent Difference values have been calculated in a manner consistent with September 27, 1979 memorandum on the Five Percent Equivalency Rule from G.T. Helms, Control Programs Operations Branch, CPDD, OAQPS, to J. Divita, Air Programs Branch, AHMD, Region V. The procedure is quoted below.

> "If a State chooses to employ the "5 percent" procedure, we recommend that it be applied on a CTG category basis by determining the total emissions allowed by the CTG presumptive norm and comparing this to the emissions allowed (including exemptions) by the State regulation. If there is less than 5 percent difference in allowable emissions, the EPA will consider that there is "no substantive difference" between the regulations and will approve the State regulation. For urbanized nonattainment areas, the procedure must be applied on an individual control strategy area basis. Other nonattainment areas (rural) within a State can be combined for purposes of a showing."

TABLE 2. REGROUPING OF WALDEN CATEGORIES BY SIC[a]

SIC	Walden group No.	% taken from that group for Facilities	% taken from that group for Emissions	Cook No.	Cook TPY	Monroe[b] No.	Monroe[b] TPY	St. Clair No.	St. Clair TPY	DuPage No.	DuPage TPY	Kane No.	Kane TPY
22	3	100	100	1	1					1	2		
	4	100	100	4	741								
				5	742					1	2		
25	7	100	100	160	8,200			2	101	12	564	11	514
	8	100	100	85	1,587					7	130	7	270
	30	57	12	110	1,456			2	30	7	90	5	68
				355	11,243			4	131	26	784	23	852
28	10-15	100	100	198	10,374			4	73	12	540	12	490
	30	29	9	160	1,608			4	65	15	208	10	131
				358	11,982			8	138	27	748	22	621
30	16	100	100	3	7			3	39	10	107	1	12
	29	100	100	52	621								
				55	628			3	39	10	107	1	12
33	31	12	31	66	5,537			2	224	6	715	4	450
				66	5,537			2	224	6	715	4	450
34	17	100	100	1,358	15,037			26	382	98	1,121	68	1,043
	18	100	100	4	51					1	36	76	154
	30	14	79	27	9,590			1	198	2	594	1	450
	31	6	3	33	535			1	22	3	69	2	44
				1,422	25,213			28	602	104	1,820	147	1,691
35	31	59	44	325	7,860			8	320	31	1,015	20	640
				325	7,860			8	320	31	1,015	20	640
36	19	100	100	324	6,227			3	21	21	364	14	2,251
	20	100	100	1	16			1	6	1	17		
	21	100	100	4	57								
				329	6,300			4	27	22	381	14	2,251
37	22	100	100	13	357					1	1		
	23	100	100	143	1,392					11	109	8	80
	24	100	100	2	1					1	0		
				158	1,749					13	110	8	80
38	31	6	3	33	535			1	22	3	69	2	44
				33	535			1	22	3	69	2	44
39	31	17	19	94	3,395			2	137	9	440	6	275
	32	100	100	170	616			5	16	11	10	7	29
	25	100	100	5	30								
				269	4,041			7	153	20	450	13	304

TABLE 2 (continued)

SIC	Walden group No.	% taken from that group for Facilities	% taken from that group for Emissions	Lake No.	Lake TPY	McHenry No.	McHenry TPY	Madison No.	Madison TPY	Will No.	Will TPY	Total No.	Total TPY
22	3	100	100	1	291							3	294
	4	100	100									4	741
				1	291							7	1,035
25	7	100	100	5	254			1	51	8	406	199	10,090
	8	100	100			1	18			2	36	102	2,041
	30	57	12	3	38	3	38	1	15	3	34	134	1,768
				8	292	4	56	2	66	13	476	435	13,899
28	10-15	100	100	14	1,370	4	181	1	13	6	140	251	13,081
	30	29	9	7	84	6	108	3	30	5	80	210	2,320
				21	1,454	10	289	4	43	11	220	461	15,401
30	16	100	100									3	7
	29	100	100	3	35	2	24					71	838
				3	35	2	24					74	845
33	31	12	31	3	288	3	374	1	105	2	280	87	7,973
				3	288	3	374	1	105	2	280	87	7,973
34	17	100	100	57	976	47	605	13	226	22	255	1,689	19,685
	18	100	100	2	12							83	253
	30	14	79	1	248	1	248			1	221	33	11,640
	31	6	3	1	28	1	36	1	10	1	27	44	773
				61	1,264	49	889	14	236	24	503	1,849	32,451
35	31	59	44	14	410	13	530	6	150	11	400	428	11,325
				14	410	13	530	6	150	11	400	428	11,325
36	19	100	100	20	464	18	401	2	16	6	46	408	9,790
	20	100	100			1	9					4	48
	21	100	100	1	11	1	24					6	92
				21	475	20	434	2	16	6	46	418	9,930
37	22	100	100	1	1	1	0			2	14	18	373
	23	100	100	3	30	4	58	2	20	3	51	174	1,740
	24	100	100	1	0	1	1			3	4	8	6
				5	31	6	59	2	20	8	69	200	2,119
38	31	6	3	1	28	1	36	1	10	1	27	43	771
				1	28	1	36	1	10	1	27	43	771
39	31	17	19	4	177	4	230	2	65	3	170	124	4,889
	32	100	100	3	0	3	7	1	0	3	0	203	678
	25	100	100									5	30
				7	177	7	237	3	65	6	170	339	5,597

Notes: a. Based on Walden Report Data.
b. No Hydrocarbon emitting facilities.

Abbreviations: TPY = Tons per year of Solvent Cleaning Emissions.
No. = Estimated number of facilities with Solvent Cleaning Emissions.

TABLE 3. SUMMARY OF COUNTY DEGREASING EMISSIONS (ALL BASED ON WALDEN DATA EXCEPT SIC 75 NEW SOURCE)

	% with degreasing		Cook		Monroe		St. Clair		DuPage		Kane	
SIC	No. facilities	Emissions	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)
22	20	0.1	1	1	0	0	0	0	0	0	0	0
25	42	2.4	149	270	0	0	2	3	11	19	10	20
28	18	2.6	64	312	0	0	1	4	5	19	4	16
30	73	4	40	25	0	0	2	2	7	4	1	0
33	67	99	44	5,482	0	0	1	222	4	708	3	446
34	52	21	739	5,295	0	0	15	126	54	382	76	355
35	80	76	260	5,974	0	0	6	243	25	771	16	486
36	85	52	280	3,276	0	0	3	14	19	198	12	1,171
37	65	27	103	472	0	0	0	0	8	30	5	22
38	100	70	33	375	0	0	1	15	3	48	2	31
39	53	7.5	143	303	0	0	4	11	11	34	7	21
75	52	–	412	1,191	0	0	27	75	52	152	30	87

TABLE 3 (continued)

	% with degreasing		Lake		McHenry		Madison		Will		Total	
SIC	No. facilities	Emissions	No. facilities	Emissons (ton/yr)	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)	No. facilities	Emissions (ton/yr)
22	20	0.1	0	0	0	0	0	0	0	0	1	1
25	42	2.4	3	7	2	1	1	2	5	11	183	334
28	18	2.6	4	38	2	8	1	1	2	6	83	400
30	73	4	2	1	1	1	0	0	0	0	54	34
33	67	99	2	285	2	370	1	104	1	277	58	7,893
34	52	21	32	265	25	187	7	50	12	106	961	6,766
35	80	76	11	312	10	403	5	114	9	304	342	8,607
36	85	52	18	247	17	226	2	8	5	24	355	5,164
37	65	27	3	8	4	16	1	5	5	19	130	572
38	100	70	1	20	1	25	1	7	1	19	43	540
39	53	7.5	4	13	4	18	2	5	3	13	180	470
75	52	–	33	92	7	19	18	51	26	74	605	1,741

TABLE 4. WORKING TABLES - SUMMARY OF QUESTIONNAIRE DATA

SIC	Questionnaire No.	Clean metal or non-metal parts	No. of cold cleaners	No. of open top vapors cleaners	No. of conveyorized vapor cleaners	No. of conveyorized cold cleaners	Emissions ton/yr (log)	Operating schedule days/yr	Illinois exempt <15 lb/day	U.S. EPA exempt non-metal
30	A	M	1	0	0	0	0.3	100	-	-
34	3	M	0	1	0	0	6.5 (0.81)	250	-	-
	5	M	0	1	0	0	1.2 (0.08)	100	-	-
35	9	M	1	0	0	0	5.9 (0.77)	200	-	-
36	3	N	1	0	0	0	0.6 (-0.22)	100	✓	✓
	A	M	0	1	0	0	0.7 (-0.15)	100	-	-
	B	M/N	0	1	0	0	19.5/19.5 (1.6)	250	-	-
	C	M	2	0	0	0	23.4 (1.4)	250	-	-
	D	N	0	0	1	0	8.6 (0.93)	250	-	✓
	E	M	1	0	0	0	3.3 (0.52)	200	-	-
37	2	M	1	0	0	0	1.0 (0)	100	-	-
35	A	M	0	1 40 ft²	0	0	21.5 (1.3)	250	-	-
	B	M	3	0	0	0	22.1 (1.3)	250	-	-
	C	M	0	1 18 ft²	0	0	17.5 (1.3)	250	-	-
				1 6 ft²						
37	A	M	1	0	0	0	2.1 (0.3)	100	-	-
	B	M	2	0	0	0	9.7 (0.99)	250	-	-
	C	M	1 >10 ft²	0	0	0	11 (1.0)	250	-	-

(continued)

TABLE 4 (continued)

SIC	Questionnaire No.	Clean metal or non-metal parts	No. of cold cleaners	No. of open top vapors cleaners	No. of conveyorized vapor cleaners	No. of conveyorized cold cleaners	Emissions ton/yr (log)	Operating schedule days/yr	Illinois exempt <15 lb/day	U.S. EPA exempt non-metal
35	1	M	1	0	0	0	0.3 (-0.52)	100	✓	-
	2	M	1	0	0	0	0.2 (-0.70)	100	✓	-
	3	M	5	0	0	0	19.3 (1.3)	250	-	-
	4	M	1	0	0	0	0.1 (-0.1)	100	✓	-
	5	M	1	0	0	0	0.2 (-0.70)	100	✓	-
	6	M	0	1	0	0	0.4 (-0.40)	100	✓	-
	7	M	1	0	0	0	2.9 (0.46)	250	-	-
	8	M	1	0	0	0	0.7 (-0.15)	100	✓	-
	10	M	1	0	0	0	2.7 (0.43)	250	-	-
	11	M	1	0	0	0	1.3 (0.11)	100	-	-
	12	M	1	0	0	0	0.8 (-0.1)	100	-	-
	13	M	1	0	0	0	0.3 (-0.52)	100	✓	-
	14	M	0	1	0	0	15.7 (1.2)	250	-	-
	15	M	1	0	0	0	0.6 (-0.22)	100	✓	-
34	1	M	0	1	0	0	22.3 (0.35)	100	-	-
	2	M	0	1	0	0	0.75 (-0.12)	100	✓	-
	3	M	0	1 0 9 ft²	0 2 38" wide openings each	0 0	4.7 5.4 (1.0)	300	-	-

(continued)

TABLE 4 (continued)

SIC	Questionnaire No.	Clean metal or non-metal parts	No. of cold cleaners	No. of open top vapors cleaners	No. of conveyorized vapor cleaners	No. of conveyorized cold cleaners	Emissions ton/yr (log)	Operating schedule days/yr	Illinois exempt <15 lb/day	U.S. EPA exempt non-metal
	4	M	0	0	1 9 ft² open/each	0	5.5 (0.74)	250	-	-
	5	M	0	1 10 ft²	0	0	2.2 (0.34)	100	-	-
	7	M	1	0	0	0	2.3 (0.36)	100	-	-
	8	M	1	0	0	0	0.34 (-0.47)	100	✓	-
	9	M	1	0	0	0	1.8 (0.26)	100	-	-
	11	M	0	2	0	0	7 (0.85)	250	-	-
	12	M	1	0	0	0	6.1 (0.79)	250	-	-
	14	M	0	1 >10 ft²	0	0	3.4 (0.53)	100	-	-
	16	M	1	0	0	0	0.67 (-0.17)	100	✓	-
	17	M	4	0	0	0	10.8 (1.03)	250	-	-
	18	M	1	0	0	0	0.40 (-0.40)	100	✓	-
	19	M	1	0	0	0	0.59 (-0.23)	250	✓	-
	20	M	1	0 >10 ft²	0	0	1.2 (0.08)	100	-	-
39	1	M	1 55 gal drum	0	0	0	0.19	100	✓	-
35	2	M	1 30" x 24"	0	0	0	0.18 (-0.74)	100	✓	-

(continued)

TABLE 4 (continued)

SIC	Questionnaire No.	Clean metal or non-metal parts	No. of cold cleaners	No. of open top vapors cleaners	No. of conveyorized vapor cleaners	No. of conveyorized cold cleaners	Emissions ton/yr (log)	Operating schedule days/yr	Illinois exempt <15 lb/day	U.S. EPA exempt non-metal
38	1	N	0	2 >1.0 m^2	0	0	19.0	250	-	✓
	2	M	0	2	0	0	6.3	250	-	-
	3	M	1	0	0	0	0.6	100	✓	-
39	1	M	1	0	0	0	50.0	300	-	-
	1	M/N	0	2/1	0	0	160/160	300	-	-/✓
	2	M	1	0	0	0	0.0	-	✓	-
37	1	M	1	0	0	0	2.0 (0.3)	100	-	-
36	1	M	0	1	0	0	3.6 (0.56)	250	-	-
	2	M	1	0	0	0	1.4 (0.15)	250	-	-
35	1	M	0	1	0	0	1.5 (0.18)	250	✓	-
36	1	M	0	1 >1.0 m^2	0	0	13.9 (1.14)	250	-	-
	2	M	0	1	0	0	8.3 (0.92)	250	-	-
	3	M	0	2	0	0	18.0 (1.26)	250	-	-
	4	M	1	0	0	0	0.9 (-0.05)	200	✓	-
	5	M	0	1 >1.0 m^2	0	0	14.8 (1.17)	250	-	-
	6	M	0	1 >1.0 m^2	0	0	34.3 (1.54)	250	-	-
34	1	M	0	3	0	0	78.1 (1.89)	250	-	-
	2	M	0	1 >1.0 m^2	0	0	2.4 (0.38)	250	-	-
	4	M	0	1 18 ft^2	0	0	11.9 (1.08)	250	-	-
	6	M	0	1 12 ft^2	0	0	15.8 (1.20)	250	-	-

(continued)

TABLE 4 (continued)

SIC	Questionnaire No.	Clean metal or non-metal parts	No. of cold cleaners	No. of open top vapors cleaners	No. of conveyorized vapor cleaners	No. of conveyorized cold cleaners	Emissions ton/yr (log)	Operating schedule days/yr	Illinois exempt <15 lb/day	U.S. EPA exempt non-metal
38	1	M	1	0	0	0	10.5	250	-	-
	1	M	0	1	0	0	15.8	250	-	-
39	1	M	6	0	0	0	110.8	250	-	-
28	1	M	1	0	0	0	1.1	200	✓	-
33	1	M	1	0	0	0	0.3	100	✓	-
	2	M	0	1	0	0	1.3	150	-	-
	3	M	1	0	0	0	0.6	100	✓	-
34	10	M	2	0	0	0	2.38 (0.38)	100	-	-
	15	M	0	1	0	0	1.77 (0.25)	100	-	-
	13	M	1	0	0	0	1.23	100	-	-
		M	0	1	0		0.58 (0.26)		✓	-

TABLE 5. NUMBER OF FACILITIES AND NUMBER OF DEGREASING FACILITIES WITHIN EACH SIC

SIC No.	No. facilities contacted Walden	No. facilities w/degreasing Walden	No. facilities contacted TAS	No. facilities w/degreasing TAS	No. facilities contacted Dunn & Brad	No. facilities w/degreasing Dunn & Brad	Total all three (Walden & TAS & D&B) facilities
22	0	0	0	0	17	0	17
25	5	0	0	0	0	0	5
28	2	0	0	0	15	1	17
30	2	1	0	0	17	0	19
33	6	0	0	0	16	3	22
34	56	18	6	4	57	3	119
35	11	5	4	1	108	14	123
36	13	6	9	6	42	4	53
37	8	4	0	0	13	1	21
38	0	0	1	1	21	3	22
39	8	1	1	1	20	2	29

TABLE 6a. WORKING TABLE FOR SIC 75

Number facilities contacted	Type of equipment	No. pieces of equipment	Sizes of equipment gal	Solvent bought (gal/yr)	Solvent mfg.[a]	Solvent emitted (gal/yr)	Solvent emitted (ton/yr)
1	Cold cleaner	5	20	1,200	SK	1,056	5.8
2	Cold cleaner	1	45	420	SK	370	2.0
3	Cold cleaner	5	20	1,700	SK	1,496	8.2
4	Cold cleaner	3	25	675	SK	594	3.3
5	Cold cleaner	1	35	300	SK	264	1.5
6	Cold cleaner	1	10	60		60	
7	Cold cleaner	2	25	850	SK	750	4.1
8	Cold cleaner	1	10	120	MS	120	0.7
9	Cold cleaner	1	15	12		12	
10	Cold cleaner	2		100		100	0.6
11	Cold cleaner	1	5	120		120	0.7
12	Cold cleaner	1	25	120	MS	120	0.7
13	Cold cleaner	1	30	240	SK	210	1.2
14	Cold cleaner	1	5	55	MS	55	
15	Cold cleaner	2-1	50-150	900		792	4.4
16	Cold cleaner	1	15	120		120	0.7
17	None						
18	None						
19	None						
20	None						
21-22	None						

(continued)

TABLE 6a. (continued)

Number facilities contacted	Type of equipment	No. pieces of equipment	Sizes of equipment gal	Solvent bought (gal/yr)	Sovlent mfg.[a]	Solvent emitted (gal/yr)	Solvent emitted (ton/yr)
23	Cold cleaner	1	45	250	SK	220	1
24	None	-	-	24 25	Brakeleen Agitene	0	0
25	None	-	-	50	DX440	0	0
26	Cold cleaner	1	45	180	SK	158	1
27	None	-	-	110	Klensol	110	0
28	Cold cleaner	1		180	SK	158	1
29	None	-	-	100		100	0
30	Cold cleaner	1	45	500	Kleenway	440	2.4
31-42	None						
43	Cold cleaner	4	45 each	2,000	SK	1,760	10
44	Cold cleaner	3	45 each	625	SK	550	3
45	Cold cleaner	10	45 each	1,536	SK	1,352	7
46	Cold cleaner	6	45 each	216	SK	190	1

[a]SK = Safety Kleen Solvent (6.5 lb/gal)

MS = Mineral spirits.

TABLE 6b. SOLVENT DENSITIES

	Density (lb/gal)
Mineral spirits 66	6.3
Toluene	7.3
Methylene chloride	11.1
Perchloroethylene	11.4
1,1,1-Trichloroethane	11.2
Trichloroethylene	12.3
Trichlorotrifluoroethane	13.4
Kerosene	7.0
Unknown solvent	7.5

TABLE 7. AUTO REPAIR FACILITIES

County	SIC	Number of establishments by employment size									Total establishments
		1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1000 or more	
Cook	7538	354	99	43	10	2	1	-	-	-	509
	7539	136	96	37	12	2	-	-	-	-	283
DuPage	7538	55	20	2	3	1	-	-	-	-	81
	7539	14	8	2	1	1	-	-	-	-	26
Kane	7538	28	6	3	1	-	-	-	-	-	38
	7539	16	3	-	1	-	-	-	-	-	20
Lake	7538	38	8	2	1	-	-	-	-	-	49
	7539	9	4	1	-	-	-	-	-	-	14
McHenry	7538	10	1	1	1	-	-	-	-	-	13
	7539	-	-	-	-	-	-	-	-	-	0
Will	7538	27	6	-	-	-	-	-	-	-	33
	7539	9	7	1	-	-	-	-	-	-	17
Madison	7538	25	6	3	-	-	-	-	-	-	34
	7539	-	-	-	-	-	-	-	-	-	0
Monroe	7538	-	-	-	-	-	-	-	-	-	0
	7539	-	-	-	-	-	-	-	-	-	0
St. Clair	7538	29	4	-	1	-	-	-	-	-	34
	7539	12	4	2	-	-	-	-	-	-	18

Source: U.S. Bureau of Census, County Business Patterns, 1977

TABLE 8. SIC 75 SOLVENT CLEANING FACILITIES AND EQUIPMENT

County	Facilities with emissions	No. of pieces of equipment	No. of facilities in emission ranges (tons/yr)					
			0-1.4	1.4-2.3	2.31-3.6	3.61-5.67	5.68-8.5	8.5 →
Cook	412	985	196	39	59	39	59	20
DuPage	52	125	25	5	7	5	8	2
Kane	30	72	14	3	4	3	5	1
Lake	33	80	16	3	5	3	5	1
McHenry	7	15	3	1	1	1	1	0
Will	26	60	12	3	4	2	4	1
Madison	18	43	9	2	2	2	2	1
Monroe	0	0	0	0	0	0	0	0
St. Clair	27	65	13	3	4	2	4	1
Total	605	1,445						

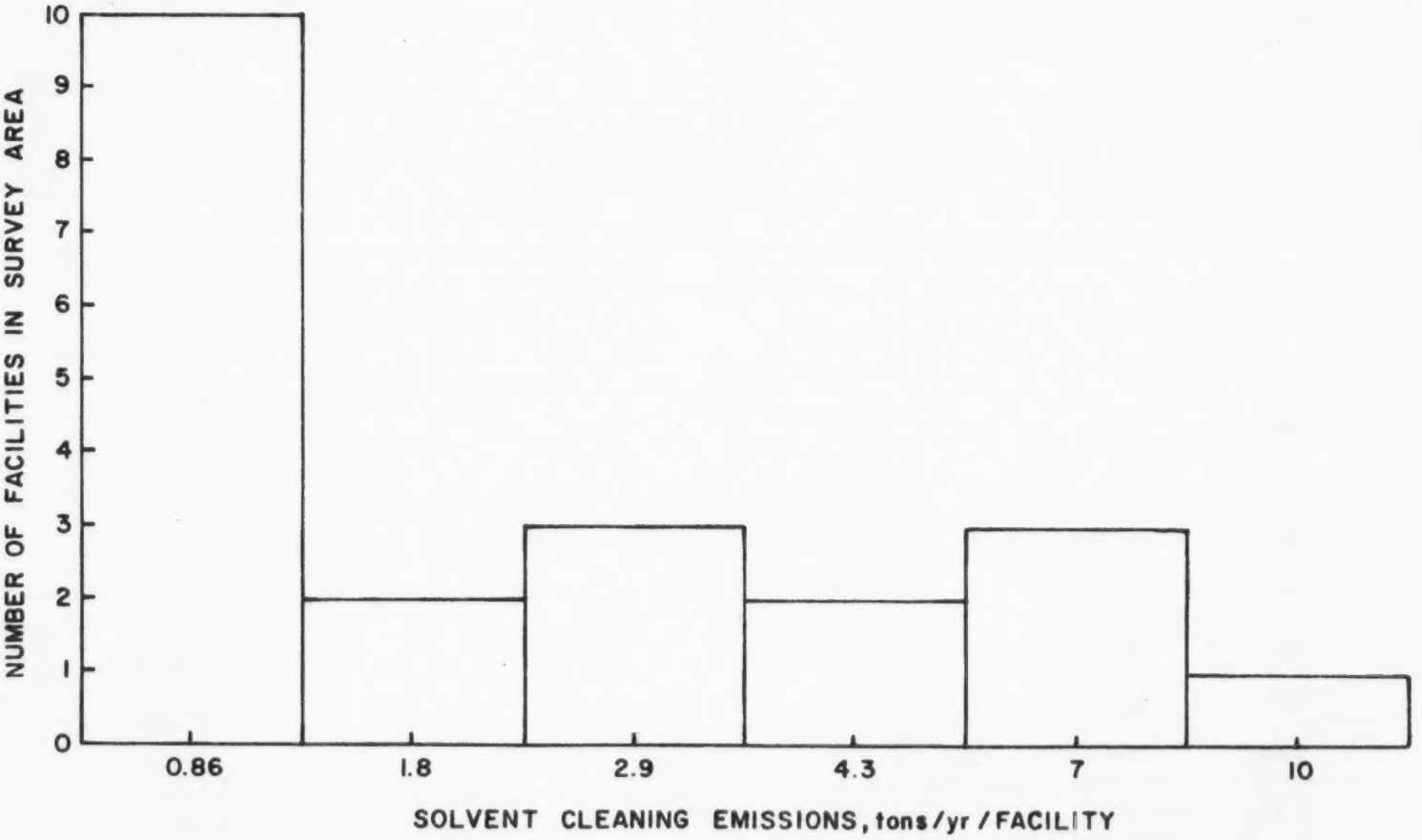


Figure 2. Size distribution of SIC 75 facilities in representative area.

TABLE 9. SIC 75 SOLVENT CLEANING EMISSIONS

County	Total (tons/yr)	Facilities in Emission ranges (tons/yr)					
		0-1.4	1.4-2.3	2.3-3.6	3.6-5.67	5.18-8.5	8.5 +
Cook	1,191	169	70	171	168	413	200
DuPage	152	21	9	20	21	56	25
Kane	87	12	5	12	13	35	10
Lake	92	14	5	15	13	35	10
McHenry	19	3	2	3	4	7	0
Will	74	10	5	12	9	28	10
Madison	51	8	4	6	9	14	10
Monroe	0	0	0	0	0	0	0
St. Clair	75	11	5	12	9	28	10
Total	1,741						

TABLE 10. NUMBER OF FACILITIES IN EACH COUNTY BY SIC

SIC	Cook	Monroe	St. Clair	DuPage	Kane	Lake	McHenry	Madison	Will	Total
22	49	0	0	0	2	5	0	0	0	56
25	264	0	0	22	20	11	0	0	9	326
28	484	0	16	46	28	35	10	10	24	653
30	422	0	0	75	40	34	25	4	16	616
33	302	0	12	36	13	17	13	22	11	426
34	1,608	0	15	183	77	69	50	21	41	2,064
35	1,744	0	35	286	111	112	81	28	48	2,445
36	607	0	9	101	41	39	32	6	11	846
37	156	0	0	16	4	7	6	4	6	199
38	302	0	0	37	14	22	8	0	0	383
39	159	0	6	42	24	21	9	7	11	279
75	792	0	52	107	58	63	13	34	50	1,169
Total	6,889	0	145	951	432	435	247	136	227	9,462

Source: U.S. Bureau of Census, County Business Patterns, 1977.

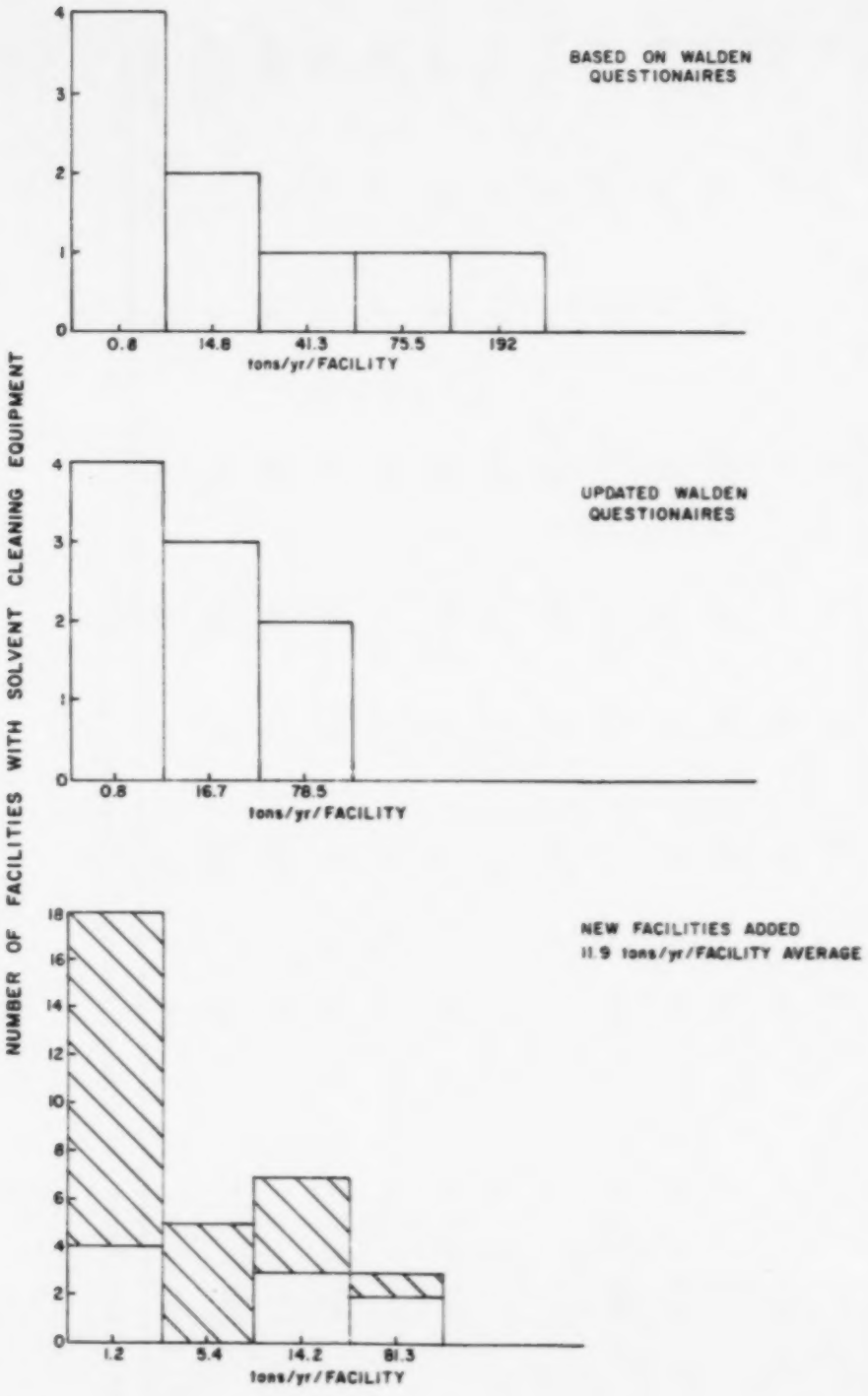


Figure 3a. Size distribution of SIC 34 facilities.

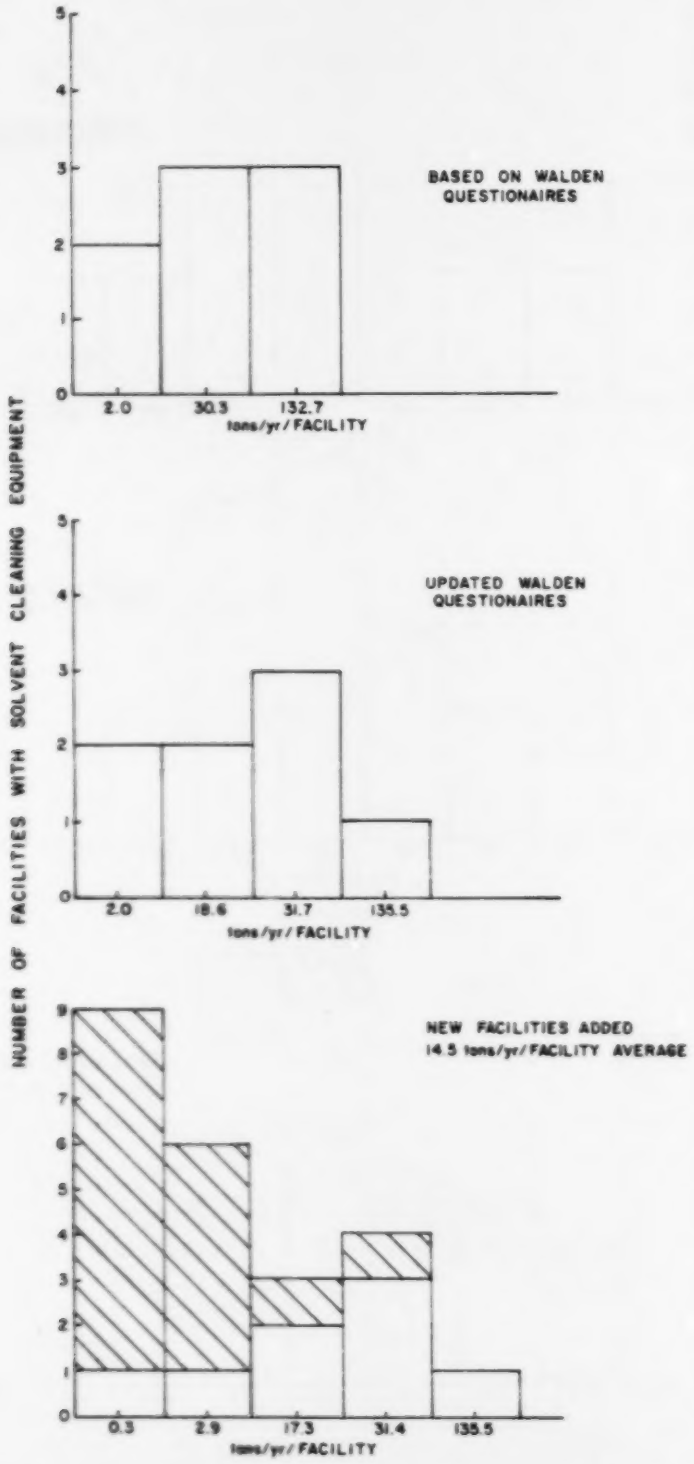


Figure 3b. Size distribution of SIC 35 facilities.

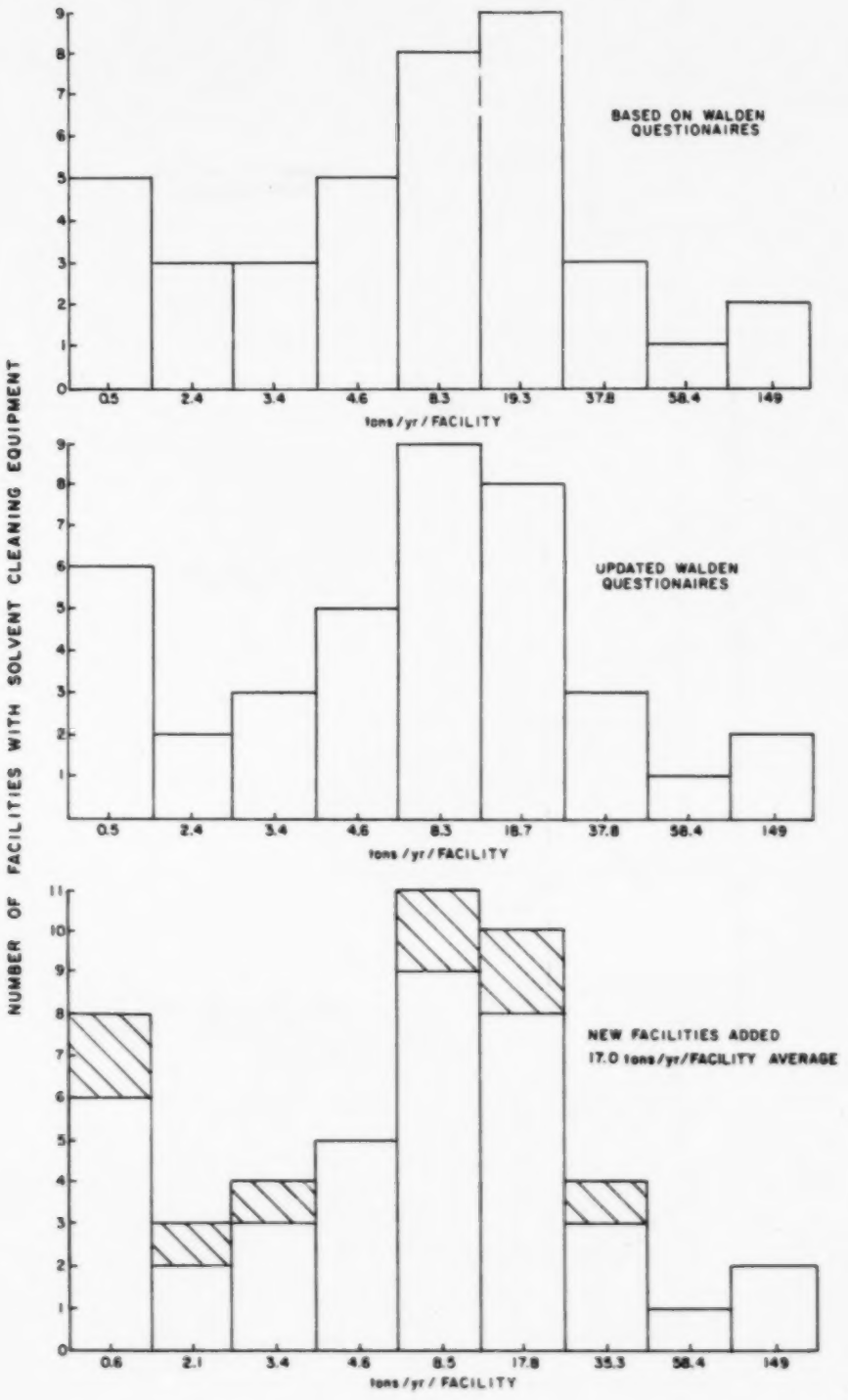


Figure 3c. Size distribution of SIC 36 facilities.

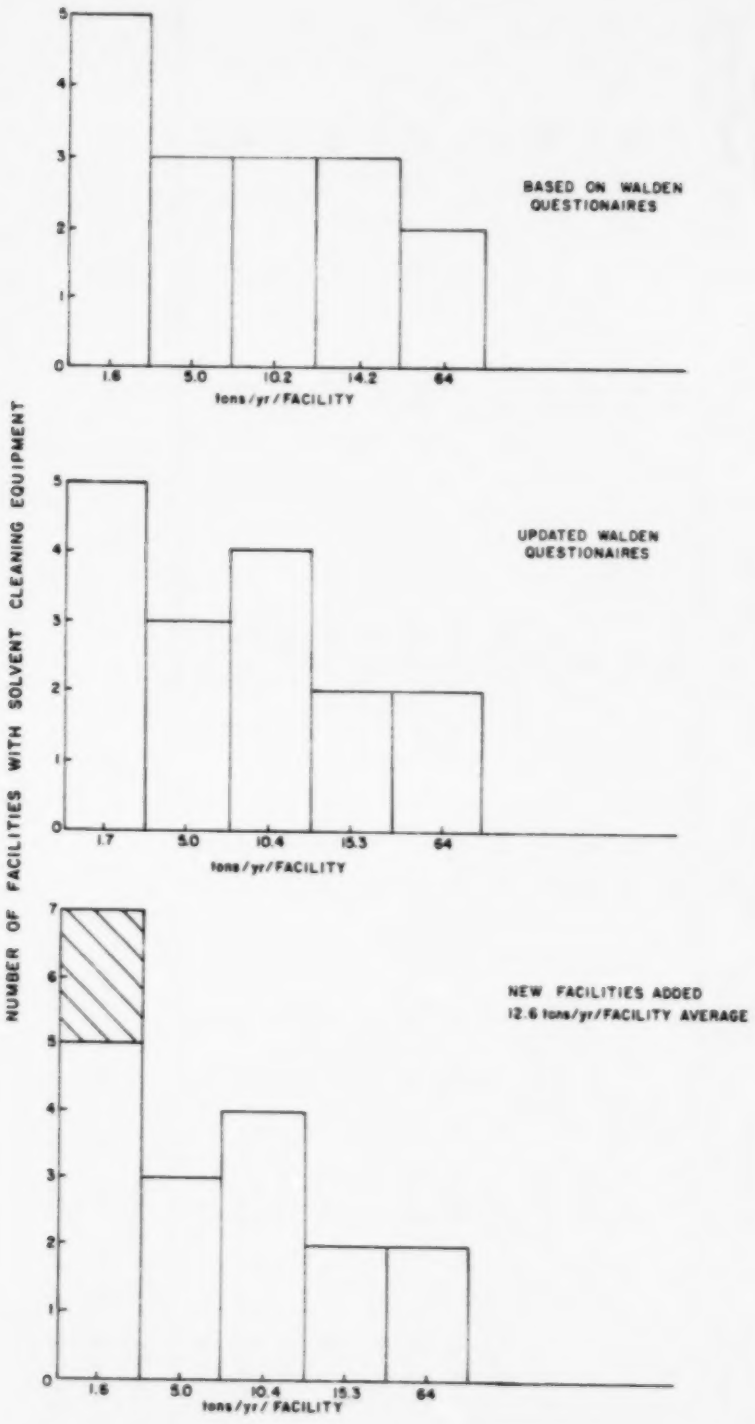


Figure 3d. Size distribution of SIC 37 facilities.

TABLE 11. FACILITY AND EMISSION PROJECTION FACTORS

SIC	Average emissions per facility from telephone survey	Average emissions per facility from Walden survey	Method[a] to obtain average emissions per facility	Average emissions per facility used	Percent of total facilities with degreasing from telephone survey	Percent of total facilities with degreasing from Walden survey	Projected percent of total facilities with degreasing
22	0	2.1	B	11.8	0	20	5
25	0	24.5	B	11.8	0	42	40
28	1.1	22.2	B	11.8	6	18	15
30	0.3	2.1	C	1.9	5.3	73	10
33	0.73	478	A	11.8	13.6	67	23
34	7.1	35.3	A	11.9	21	52	47
35	5.7	50.7	A	14.5	16.3	80	21
36	12.2	22.6	A	17	26.4	85	49
37	5.2	16.3	A	12.6	23.8	65	68
38	13	29	B	11.8	18.2	100	40
39	120.2	18	B	11.8	13.8	53	30
75	2.9	-	A	2.9	52.2	-	52

[a]A - GCA data and graphs.

B - average of 34, 35, 36, 37 and 75.

C - GCA survey and Walden questionnaires.

TABLE 12. ESTIMATED FACILITIES AND EMISSIONS BY COUNTY AND SIC

SIC	Percent facilities with degreasing	Average emissions facility tons/yr	Cook		Monroe		St. Clair		DuPage		Kane	
			No.	Tons/yr	No.	Tons/yr	No.	Tons/yr	No.	Tons/yr	No.	Tons/yr
22	5	11.8	3	35	0	0	0	0	0	0	0	0
25	40	11.8	106	1,250	0	0	0	0	9	106	8	94
28	15	11.8	72	850	0	0	2	24	7	83	4	47
30	10	1.9	42	80	0	0	0	0	7	13	4	8
33	23	11.8	69	814	0	0	3	35	8	94	3	35
34	47	11.9	756	9,000	0	0	7	83	86	1,020	36	428
35	21	14.5	366	5,310	0	0	7	101	60	870	23	333
36	49	17	297	5,049	0	0	4	68	49	833	20	340
37	68	12.6	106	1,340	0	0	0	0	11	139	3	38
38	40	11.8	121	1,430	0	0	0	0	15	177	6	71
39	30	11.8	48	566	0	0	2	2/	13	153	7	83
75	52	2.9	412	1,190	0	0	27	75	52	152	30	87
Total			2,398	26,914	0	0	52	410	317	5,040	144	1,564

(continued)

TABLE 12 (continued)

SIC	Percent facilities with degreasing	Average emissions facility tons/yr	Lake		McHenry		Madison		Will		Total	
			No.	Tons/yr	No.	Tons/yr	No.	Tons/yr	No.	Tons/yr	No.	Tons/yr
22	5	11.8	0	0	0	0	0	0	0	0	3	35
25	40	11.8	5	59	0	0	0	0	4	47	132	1,556
28	15	11.8	5	59	0	0	0	0	5	59	95	1,118
30	10	1.9	3	6	3	6	0	0	2	4	61	117
33	23	11.8	4	47	3	35	5	59	3	35	98	1,156
34	47	11.9	32	381	23	274	10	119	18	214	968	11,519
35	21	14.5	24	348	16	232	6	87	10	145	512	7,426
36	49	17	19	323	15	255	3	51	5	85	412	7,004
37	68	12.6	5	63	5	63	3	38	5	63	138	1,744
38	40	11.8	9	106	2	24	0	0	0	0	153	1,808
39	30	11.8	6	71	3	35	2	24	3	35	84	991
75	52	2.9	33	92	7	19	18	51	26	74	605	1,740
Total			145	1,555	77	937	47	429	81	761	3,261	36,218

TABLE 13. OPERATING SOLVENT CLEANERS[a]

SIC code	No. of cold cleaners	No. of OTV	No. of CV	No. of CC	No. exempted	
					U.S. EPA	IEPA
			COOK COUNTY			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	46	23	0	0	0	46
34	454	514	91	0	0	185
35	384	92	0	0	0	183
36	119	178	21	0	60	39
37	127	0	0	0	0	0
38	60	151	0	0	60	30
39	96	36	0	0	12	0
75	985	0	0	0	0	560
			ST. CLAIR			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	2	1	0	0	0	2
34	4	5	1	0	1	1
35	7	2	0	0	0	4
36	2	2	1	0	0	1
37	0	0	0	0	0	0
38	0	0	0	0	0	0
39	4	2	0	0	1	0
75	65	0	0	0	0	37

(continued)

TABLE 13 (continued)

SIC code	No. of cold cleaners	No. of OTV	No. of CV	No. of CC	No. exempted	
					U.S. EPA	IEPA
			DUPAGE			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	5	3	0	0	0	5
34	52	58	10	0	0	21
35	63	15	0	0	0	30
36	20	29	3	0	9	7
37	11	0	0	0	0	0
38	8	19	0	0	8	4
39	26	10	0	0	3	0
75	125	0	0	0	0	70
			KANE			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	2	1	0	0	0	2
34	22	24	4	0	0	9
35	24	6	0	0	0	11
36	8	12	1	0	4	3
37	4	0	0	0	0	0
38	3	8	0	0	3	2
39	14	5	0	0	2	0
75	72	0	0	0	0	40

(continued)

TABLE 13 (continued)

SIC code	No. of cold cleaners	No. of OTV	No. of CV	No. of CC	No. exempted	
					U.S. EPA	IEPA
			LAKE			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	3	1	0	0	0	3
34	19	22	4	0	0	8
35	25	6	0	0	0	12
36	7	11	1	0	3	2
37	6	0	0	0	0	0
38	5	11	0	0	4	2
39	12	5	0	0	2	0
75	80	0	0	0	0	45
			McHENRY			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	2	1	0	0	0	2
34	14	16	3	0	0	6
35	17	4	0	0	0	8
36	6	9	1	0	3	2
37	6	0	0	0	0	0
38	1	3	0	0	1	0
39	6	2	0	0	1	0
75	15	0	0	0	0	9

(continued)

TABLE 13 (continued)

SIC code	No. of cold cleaners	No. of OTV	No. of CV	No. of CC	No. exempted	
					U.S. EPA	IEPA
22	-	-	MADISON	-	-	-
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	3	2	0	0	0	3
34	6	7	1	0	0	3
35	6	2	0	0	0	3
36	1	2	1	0	2	0
37	4	0	0	0	0	0
38	0	0	0	0	0	0
39	4	2	0	0	1	0
75	43	0	0	0	0	26
			WILL			
22	-	-	-	-	-	-
25	-	-	-	-	-	-
28	-	-	-	-	-	-
30	-	-	-	-	-	-
33	2	1	0	0	0	2
34	11	12	2	0	0	4
35	11	3	0	0	0	5
36	2	3	0	0	1	1
37	6	0	0	0	0	0
38	0	0	0	0	0	0
39	6	2	0	0	1	0
75	60	0	0	0	0	36

[a]OTV - Open top vapor cleaners.

CV - Conveyorized vapor cleaners

CC - Conveyorized cold cleaners

TABLE 14. ACTUAL EMISSIONS[a]

SIC code	Cold cleaners emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			COOK COUNTY		
22	-	-	-	-	35
25	-	-	-	-	1,250
28	-	-	-	-	850
30	-	-	-	-	80
33	212	602	0	0	814
34	1,260	5,400	2,340	0	9,000
35	1,062	4,248	0	0	5,310
36	858	2,629	1,565	0	5,049
37	1,340	0	0	0	1,340
38	572	858	0	0	1,430
39	96	470	0	0	566
75	1,190	0	0	0	1,190
Total					26,914
			ST. CLAIR		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	0	0	0	0	0
33	9	26	0	0	35
34	12	50	21	0	83
35	20	81	0	0	101
36	12	35	21	0	68
37	0	0	0	0	0
38	0	0	0	0	0
39	4	20	0	0	24
75	75	0	0	0	75
Total					317
			DUPAGE		
22	0	0	0	0	0
25	-	-	-	-	106
28	-	-	-	-	83
30	-	-	-	-	13
33	24	70	0	0	94
34	143	612	265	0	1,020
35	174	696	0	0	870
36	142	433	258	0	833
37	139	0	0	0	139

(continued)

TABLE 14 (continued)

SIC code	Cold cleaners emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		DUPAGE (continued)			
38	71	106	0	0	177
39	26	127	0	0	153
75	152	0	0	0	152
Total					5,040
		KANE			
22	0	0	0	0	0
25	-	-	-	-	94
28	-	-	-	-	47
30	-	-	-	-	8
33	9	26	0	0	35
34	60	257	111	0	428
35	67	266	0	0	333
36	58	177	105	0	340
37	38	0	0	0	38
38	28	43	0	0	71
39	14	69	0	0	83
75	87	0	0	0	87
Total					1,564
		LAKE			
22	0	0	0	0	0
25	-	-	-	-	59
28	-	-	-	-	59
30	-	-	-	-	6
33	12	35	0	0	47
34	53	229	99	0	381
35	70	278	0	0	348
36	55	168	100	0	323
37	63	0	0	0	63
38	25	38	0	0	63
39	12	59	0	0	71
75	92	0	0	0	92
Total					1,512

(continued)

TABLE 14 (continued)

SIC code	Cold cleaners emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			McHENRY		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	-	-	-	-	6
33	9	26	0	0	35
34	38	165	71	0	274
35	46	186	0	0	232
36	43	133	79	0	255
37	63	0	0	0	63
38	10	14	0	0	24
39	6	29	0	0	35
75	19	0	0	0	19
Total					924
			MADISON		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	0	0	0	0	0
33	15	44	0	0	59
34	17	71	31	0	119
35	17	70	0	0	87
36	9	26	16	0	51
37	38	0	0	0	38
38	0	0	0	0	0
39	4	20	0	0	24
75	51	0	0	0	51
Total					298
			WILL		
22	0	0	0	0	0
25	-	-	-	-	47
28	-	-	-	-	59
30	-	-	-	-	4
33	9	26	0	0	35
34	30	128	56	0	214
35	29	116	0	0	145

(continued)

TABLE 14 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
36	14	45	26	0	85
37	62	0	0	0	63
38	0	0	0	0	0
39	6	29	0	0	35
75	74	0	0	0	74
Total					522

[a]OTV - Open top vapor cleaner.

CV - Conveyorized vapor cleaner.

CC - Conveyorized cold cleaner.

TABLE 15. EXEMPTED EMISSIONS[a]

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		COOK COUNTY - IEPA			
33	30	0	0	0	30
34	80	40	0	0	120
35	95	24	0	0	119
36	25	0	0	0	25
37	0	0	0	0	0
38	20	0	0	0	20
39	0	0	0	0	0
75	364	0	0	0	364
		COOK COUNTY - U.S. EPA			
36	0	578	1,565	0	2,143
38	0	343	0	0	343
39	0	155	0	0	155
		ST. CLAIR - IEPA			
33	1	0	0	0	1
34	1	0	0	0	1
35	2	1	0	0	3
36	1	0	0	0	1
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
75	24	0	0	0	24
		ST. CLAIR - U.S. EPA			
36	0	11	21	0	32
38	0	0	0	0	0
39	0	7	0	0	7
		DUPAGE - IEPA			
33	3	0	0	0	3
34	9	5	0	0	14
35	16	4	0	0	20
36	5	0	0	0	5
37	0	0	0	0	0
38	3	0	0	0	3
39	0	0	0	0	0
75	45	0	0	0	45

(continued)

TABLE 15 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		DUPAGE - U.S. EPA			
36	0	95	258	0	353
38	0	42	0	0	42
39	0	42	0	0	42
		KANE - IEPA			
33	1	0	0	0	1
34	4	2	0	0	6
35	6	1	0	0	7
36	2	0	0	0	2
37	0	0	0	0	0
38	1	0	0	0	1
39	0	0	0	0	0
75	26	0	0	0	26
		KANE - U.S. EPA			
36	0	57	105	0	162
38	0	17	0	0	17
39	0	23	0	0	23
		LAKE - IEPA			
33	2	0	0	0	2
34	3	2	0	0	5
35	7	1	0	0	8
36	1	0	0	0	1
37	0	0	0	0	0
38	1	0	0	0	1
39	0	0	0	0	0
75	29	0	0	0	29
		LAKE - U.S. EPA			
36	0	37	100	0	137
38	0	15	0	0	15
39	0	20	0	0	20

(continued)

TABLE 15 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CT emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		McHENRY - IEPA			
33	1	0	0	0	1
34	3	1	0	0	4
35	4	1	0	0	5
36	1	0	0	0	1
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
75	6	0	0	0	6
		McHENRY - U.S. EPA			
36	0	29	79	0	108
38	0	6	0	0	6
39	0	10	0	0	10
		MADISON - IEPA			
33	2	0	0	0	2
34	1	1	0	0	2
35	1	1	0	0	2
36	0	0	0	0	0
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
75	17	0	0	0	17
		MADISON - U.S. EPA			
36	0	6	16	0	22
38	0	0	0	0	0
39	0	7	0	0	7
		WILL - IEPA			
33	1	0	0	0	1
34	2	1	0	0	3
35	3	1	0	0	4
36	1	0	0	0	1
37	0	0	0	0	0
38	0	0	0	0	0
39	0	0	0	0	0
75	23	0	0	0	23

(continued)

TABLE 15 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			WILL - U.S. EPA		
36	0	10	26	0	36
38	0	0	0	0	0
39	0	10	0	0	10

[a]OTV - Open top vapor cleaner.

CV - Conveyorized vapor cleaner.

CC - Conveyorized cold cleaner.

TABLE 16. AP-42 EMISSION FACTORS[a]

	Cold cleaners volatility		Open top vapor opening		Conveyorized vapor opening	
	<0.6 psi at 100°F	>0.6 psi at 100°F	<1.0 m^2	>1.0 m^2	<2.0 m^2	>2.0 m^2
Poor compliance	0.72	0.45	0.70	0.55	0.8	0.50
Excellent compliance	0.17	0.31	0.40	0.25	0.7	0.30

[a]Obtained from AP-42, p. 4.6-4

TABLE 17. PERCENTAGES TO OBTAIN CORRECTED EMISSION FACTORS

SIC code	Cold cleaners		Open top vapor		Conveyorized	
	% with volatility <0.6 psia at 100°F	% with volatility >0.6 psia at 100°f	% with opening <1.0 m^2	% with opening >1.0 m^2	% with opening <2.0 m^2	% with opening >2.0 m^2
33	0	100	100	0	-	-
34	0	100	71	29	100	0
35	0	100	80	20	-	-
36	0	100	67	33	100	0
37	0	100	-	-	-	-
38	0	100	60	40	-	-
39	0	100	100	0	-	-

TABLE 18. CORRECTED EMISSION FACTORS

SIC	Cold cleaners		Open top vapor		Conveyorized vapor	
	Poor compliance	Excellent compliance	Poor compliance	Excellent compliance	Poor compliance	Excellent compliance
33	0.45	0.31	0.70	0.40	-	-
34	0.45	0.31	0.66	0.36	0.80	0.70
35	0.45	0.31	0.67	0.37	-	-
36	0.45	0.31	0.65	0.35	0.80	0.70
37	0.45	0.31	-	-	-	-
38	0.45	0.31	0.64	0.34	-	-
39	0.45	0.31	0.70	0.40	-	-

TABLE 19. CTG PRESUMPTIVE NORM LOW EMISSIONS - EXCELLENT COMPLIANCE[a]

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			COOK COUNTY		
22	-	-	-	-	16
25	-	-	-	-	560
28	-	-	-	-	380
30	-	-	-	-	36
33	66	241	0	0	307
34	340	1,940	1,640	0	3,970
35	329	1,570	0	0	1,899
36	266	1,300	1,565	0	3,131
37	415	0	0	0	415
38	177	518	0	0	695
39	30	281	0	0	311
75	369	0	0	0	369
Total					12,089
			ST. CLAIR		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	14
30	0	0	0	0	0
33	3	10	0	0	13
34	4	18	15	0	37
35	60	30	0	0	90
36	4	19	21	0	44
37	0	0	0	0	0
38	0	0	0	0	0
39	1	12	0	0	13
75	23	0	0	0	23
Total					234
			DUPAGE		
22	0	0	0	0	0
25	-	-	-	-	48
28	-	-	-	-	38
30	-	-	-	-	6
33	7	28	0	0	35
34	44	220	186	0	450
35	54	258	0	0	312
36	44	213	258	0	515

(continued)

TABLE 19 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			DUPAGE (continued)		
37	43	0	0	0	43
38	22	64	0	0	86
39	8	76	0	0	84
75	47	0	0	0	47
Total					1,664
			KANE		
22	0	0	0	0	0
25	-	-	-	-	45
28	-	-	-	-	23
30	-	-	-	-	4
33	3	10	0	0	13
34	18	93	78	0	189
35	21	98	0	0	119
36	18	99	105	0	222
37	12	0	0	0	12
38	9	26	0	0	35
39	4	41	0	0	45
75	27	0	0	0	27
Total					734
			LAKE		
22	0	0	0	0	0
25	-	-	-	-	26
28	-	-	-	-	26
30	-	-	-	-	3
33	4	14	0	0	18
34	16	82	69	0	167
35	22	103	0	0	125
36	17	83	100	0	200
37	20	0	0	0	20
38	8	23	0	0	41
39	4	36	0	0	40
75	29	0	0	0	29
Total					695

(continued)

TABLE 19 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			McHENRY		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	-	-	-	-	2
33	3	10	0	0	13
34	12	59	50	0	121
35	14	69	0	0	83
36	13	65	79	0	157
37	20	0	0	0	20
38	3	9	0	0	12
39	2	18	0	0	20
75	6	0	0	0	6
Total					434
			MADISON		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	0	0	0	0	0
33	5	18	0	0	23
34	5	26	22	0	53
35	5	26	0	0	31
36	3	13	16	0	32
37	12	0	0	0	12
38	0	0	0	0	0
39	1	12	0	0	13
75	16	0	0	0	16
Total					180
			WILL		
22	0	0	0	0	0
25	-	-	-	-	18
28	-	-	-	-	23
30	-	-	-	-	2
33	3	10	0	0	13
34	9	46	39	0	94
35	9	43	0	0	52

(continued)

TABLE 19 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		WILL (continued)			
36	4	22	2	0	28
37	20	0	0	0	20
38	0	0	0	0	0
39	2	18	0	0	20
75	23	0	0	0	23
Total					293

[a]OTV - Open top vapor cleaner.

CV - Conveyorized vapor cleaner.

CC - Conveyorized cold cleaner.

TABLE 20. CTG PRESUMPTIVE NORM HIGH EMISSIONS - POOR COMPLIANCE[a]

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			COOK COUNTY		
22	-	-	-	-	23
25	-	-	-	-	820
28	-	-	-	-	560
30	-	-	-	-	52
33	95	421	0	0	516
34	567	3,564	1,872	0	6,003
35	478	2,846	0	0	3,324
36	386	1,911	1,565	0	3,862
37	603	0	0	0	603
38	257	673	0	0	930
39	43	376	0	0	419
75	536	0	0	0	536
Total					17,648
			ST. CLAIR		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	15
30	0	0	0	0	0
33	4	18	0	0	22
34	5	33	17	0	55
35	9	54	0	0	63
36	5	27	21	0	53
37	0	0	0	0	0
38	0	0	0	0	0
39	2	16	0	0	18
75	34	0	0	0	34
Total					260
			DUPAGE		
22	0	0	0	0	0
25	-	-	-	-	70
28	-	-	-	-	55
30	-	-	-	-	9
33	11	49	0	0	60
34	64	404	212	0	680

(continued)

TABLE 20 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
35	78	466	0	0	544
36	64	315	258	0	637
37	63	0	0	0	63
38	32	83	0	0	115
39	12	102	0	0	114
75	68	0	0	0	68
Total					2,415
			KANE		
22	0	0	0	0	0
25	-	-	-	-	64
28	-	-	-	-	32
30	-	-	-	-	5
33	4	18	0	0	22
34	27	170	89	0	286
35	30	178	0	0	208
36	26	135	105	0	266
37	17	0	0	0	17
38	13	34	0	0	47
39	6	55	0	0	61
75	39	0	0	0	39
Total					1,047
			LAKE		
22	0	0	0	0	0
25	-	-	-	-	38
28	-	-	-	-	38
30	-	-	-	-	4
33	5	25	0	0	30
34	24	151	79	0	254
35	32	186	0	0	218
36	25	122	100	0	247
37	28	0	0	0	28
38	11	30	0	0	41
39	5	47	0	0	52
75	41	0	0	0	41
Total					991

(continued)

TABLE 20 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			MCHENRY		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	-	-	-	-	4
33	4	18	0	0	22
34	17	109	57	0	183
35	21	125	0	0	146
36	19	97	79	0	195
37	28	0	0	0	28
38	4	11	0	0	15
39	3	23	0	0	26
75	9	0	0	0	9
Total					628
			MADISON		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	0	0	0	0	0
33	7	31	0	0	38
34	8	47	25	0	80
35	8	47	0	0	55
36	4	19	16	0	39
37	17	0	0	0	17
38	0	0	0	0	0
39	2	16	0	0	18
75	23	0	0	0	23
Total					270
			WILL		
22	0	0	0	0	0
25	-	-	-	-	29
28	-	-	-	-	37
30	-	-	-	-	3
33	4	18	0	0	22
34	14	84	45	0	143

(continued)

TABLE 20 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		WILL (continued)			
35	13	78	0	0	91
36	6	33	26	0	65
37	28	0	0	0	28
38	0	0	0	0	0
39	3	23	0	0	26
75	33	0	0	0	33
Total					477

[a]OTV - Open top vapor cleaner.

CV - Conveyorized vapor cleaner.

CC - Conveyorized cold cleaner.

TABLE 21. IEPA RULE LOW EMISSIONS - EXCELLENT COMPLIANCE[a]

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			COOK COUNTY		
22	-	-	-	-	15
25	-	-	-	-	530
28	-	-	-	-	360
30	-	-	-	-	34
33	86	241	0	0	327
34	446	1,970	1,638	0	4,054
35	395	1,587	0	0	1,982
36	283	920	1,096	0	2,299
37	415	0	0	0	415
38	191	292	0	0	483
39	30	188	0	0	218
75	620	0	0	0	620
Total					11,337
			ST. CLAIR		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	12
30	0	0	0	0	0
33	3	10	0	0	13
34	4	18	15	0	37
35	8	31	0	0	39
36	4	12	15	0	31
37	0	0	0	0	0
38	0	0	0	0	0
39	1	8	0	0	9
75	60	0	0	0	60
Total					201
			DUPAGE		
22	0	0	0	0	0
25	-	-	-	-	45
28	-	-	-	-	35
30	-	-	-	-	5
33	10	28	0	0	38
34	51	224	186	0	461

(continued)

TABLE 21 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	C. emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		DUPAGE (continued)			
35	65	260	0	0	325
36	47	152	181	0	380
37	43	0	0	0	43
38	24	36	0	0	60
39	8	51	0	0	59
75	78	0	0	0	78
Total					1,529
		KANE			
22	0	0	0	0	0
25	-	-	-	-	42
28	-	-	-	-	21
30	-	-	-	-	4
33	3	10	0	0	13
34	21	94	78	0	193
35	25	99	0	0	124
36	19	62	74	0	145
37	12	0	0	0	12
38	9	15	0	0	24
39	4	28	0	0	32
75	69	0	0	0	69
Total					679
		LAKE			
22	0	0	0	0	0
25	-	-	-	-	24
28	-	-	-	-	24
30	-	-	-	-	2
33	5	14	0	0	19
34	19	84	69	0	172
35	27	103	0	0	130
36	18	59	70	0	147
37	20	0	0	0	20
38	8	13	0	0	21
39	4	24	0	0	28
75	49	0	0	0	49
Total					636

(continued)

TABLE 21 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			MADISON		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	0	0	0	0	0
33	4	18	0	0	22
34	6	26	22	0	54
35	6	25	0	0	31
36	3	9	11	0	23
37	12	0	0	0	12
38	0	0	0	0	0
39	1	8	0	0	9
75	28	0	0	0	28
Total					179
			McHENRY		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	-	-	-	-	2
33	3	10	0	0	13
34	12	67	50	0	129
35	17	68	0	0	85
36	14	49	55	0	118
37	20	0	0	0	20
38	3	5	0	0	4
39	2	12	0	0	14
75	4	0	0	0	4
Total					389
			WILL		
22	0	0	0	0	0
25	-	-	-	-	20
28	-	-	-	-	25
30	-	-	-	-	2
33	3	10	0	0	13
34	11	47	39	0	97

(continued)

TABLE 21 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		WILL (continued)			
35	11	44	0	0	55
36	5	16	18	0	39
37	20	0	0	0	20
38	0	0	0	0	0
39	2	12	0	0	14
75	39	0	0	0	39
Total					324

[a]OTV - Open top vapor cleaner.

CV - Conveyorized vapor cleaner.

CC - Conveyorized cold cleaner.

TABLE 22. IEPA RULE HIGH EMISSIONS - POOR COMPLIANCE[a]

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			COOK COUNTY		
22	-	-	-	-	22
25	-	-	-	-	800
28	-	-	-	-	550
30	-	-	-	-	51
33	112	421	0	0	533
34	611	3,578	1,872	0	6,061
35	530	2,854	0	0	3,384
36	400	1,709	1,252	0	3,361
37	603	0	0	0	603
38	268	549	0	0	817
39	43	329	0	0	372
75	736	0	0	0	736
Total					17,290
			ST. CLAIR		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	16
30	0	0	0	0	0
33	5	18	0	0	23
34	6	33	17	0	56
35	10	55	0	0	65
36	6	23	17	0	46
37	0	0	0	0	0
38	0	0	0	0	0
39	2	14	0	0	16
75	47	0	0	0	47
Total					269
			DUPAGE		
22	0	0	0	0	0
25	-	-	-	-	69
28	-	-	-	-	54
30	-	-	-	-	8
33	12	49	0	0	61
34	69	405	212	0	686

(continued)

TABLE 22 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		DUPAGE (continued)			
35	87	468	0	0	555
36	67	281	206	0	554
37	63	0	0	0	63
38	34	68	0	0	102
39	12	89	0	0	101
75	131	0	0	0	131
Total					2,384
		KANE			
22	0	0	0	0	0
25	-	-	-	-	62
28	-	-	-	-	31
30	-	-	-	-	5
33	4	18	0	0	22
34	29	170	89	0	288
35	33	179	0	0	212
36	27	115	84	0	226
37	17	0	0	0	17
38	13	28	0	0	41
39	6	48	0	0	54
75	53	0	0	0	53
Total					1,011
		LAKE			
22	0	0	0	0	0
25	-	-	-	-	37
28	-	-	-	-	37
30	-	-	-	-	4
33	7	25	0	0	32
34	26	151	79	0	256
35	35	187	0	0	222
36	25	109	80	0	214
37	28	0	0	0	28
38	12	24	0	0	36
39	5	41	0	0	46
75	73	0	0	0	73
Total					985

(continued)

TABLE 22 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
			McHENRY		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	-	-	-	-	4
33	5	18	0	0	23
34	19	109	57	0	185
35	23	125	0	0	148
36	20	86	63	0	169
37	28	0	0	0	28
38	5	9	0	0	14
39	3	20	0	0	23
75	12	0	0	0	12
Total					606
			MADISON		
22	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
30	0	0	0	0	0
33	8	31	0	0	39
34	8	47	25	0	70
35	8	47	0	0	55
36	4	17	13	0	34
37	17	0	0	0	17
38	0	0	0	0	0
39	2	14	0	0	16
75	44	0	0	0	44
Total					275
			WILL		
22	0	0	0	0	0
25	-	-	-	-	30
28	-	-	-	-	39
30	-	-	-	-	3
33	5	18	0	0	23
34	15	85	45	0	145

(continued)

TABLE 22 (continued)

SIC code	Cold cleaner emissions (tons/yr)	OTV emissions (tons/yr)	CV emissions (tons/yr)	CC emissions (tons/yr)	Total (tons/yr)
		WILL (continued)			
35	15	78	0	0	93
36	7	29	21	0	57
37	28	0	0	0	28
38	0	0	0	0	0
39	3	20	0	0	23
75	64	0	0	0	64
Total					505

[a]OTV - Open top vapor cleaner.

CV - Conveyorized vapor cleaner.

CC - Conveyorized cold cleaner.

TABLE 23. ILLINOIS EXEMPT AND MAJOR CONTROL DEVICE EXEMPT EQUIPMENT AND EMISSIONS

County	No. of pieces of equipment emitting < 15 lb/day	Emissions from column A equipment TPY	No. of pieces of OTV[a] equipment < 1.0 m^2	Emissions from column C equipment TPY	No. of pieces of conveyorized equipment < 2.0 m^2	Emissions from column E equipment TPY
Cook	1043	678	994	7530	112	3900
St. Clair	45	30	8	112	2	40
DuPage	133	90	93	1080	13	520
Kane	67	43	40	440	5	220
Lake	72	46	38	430	5	200
McHenry	27	17	25	290	4	150
Madison	35	23	10	120	2	50
Will	46	32	15	180	2	80
Total	1468	950	1223	10182	144	5160

[a]OTV - Open top vapor cleaner.

TABLE 24. METAL AND NON-METAL CLEANERS

County	No. of non-metal cleaners	Emissions from non-metal cleaners (tons/yr)	No. of metal cleaners	Emissions from metal cleaners (tons/yr)
Cook	132	2,641	3,245	24,273
St. Clair	2	39	95	371
DuPage	20	437	437	4,603
Kane	9	202	201	1,362
Lake	9	172	209	1,383
McHenry	5	124	101	813
Madison	3	29	81	400
Will	2	46	119	715
Total	182	3,690	4,488	33,920

TABLE 25. COMPARISON OF ALLOWABLE EMISSIONS

County	High emissions		Low emissions	
	IEPA	CTG	IEPA	CTG
Cook	17,290	17,648	11,337	12,089
DuPage	2,384	2,415	1,529	1,664
Kane	1,011	1,047	679	734
Lake	985	991	636	695
McHenry	606	628	389	434
Will	505	477	324	293
Total	22,781	23,206 (-1.8)	14,894	15,909 (-6.4)
Madison	275	270	179	180
St. Clair	269	260	201	234
Total	544	530 (2.6)	380	414 (-8.2)

( ) = Percent difference between IEPA and CTG allowable emissions.

SECTION 4

DATA VALIDATION

The representativeness of the sample area chosen by GCA, when compared to the actual distribution of facilities by SIC category in Cook County and the size distribution of facilities within SIC categories, is an important consideration in determining the validity of projection factors. Table 26 compares the percent of facilities in SIC categories in Cook County to categories in the survey area. These two distributions compare very well with a maximum difference of 3.6 percent for SIC 28. For SIC categories containing more than 10 percent of Cook County facilities the maximum difference is 2 percent.

TABLE 26. COMPARISON OF FACILITIES BY SIC CATEGORY

SIC	Bureau of Census[a] percent of total for Cook County	Survey area percent of total for survey area
22	0.7	3.4
25	3.8	1.0
28	7.0	3.4
30	6.1	3.8
33	4.4	4.4
34	23	24
35	25	24
36	8.8	12
37	2.3	4.4
38	4.4	4.4
39	2.3	5.8
75	11	9

[a]Bureau of Census, County Business Patterns, 1977.

The size distribution of facilities within SIC categories (based on emissions) was checked in two different ways. GCA anticipated that most of the new data collected in the survey area would be from smaller facilities when compared to the data collected by Walden. This is born out in the graphs in Figures 3a through 3d. More importantly, IEPA expected emissions to fit a log-normal distribution. GCA calculated the logs of emissions per facility for all facilities in SIC categories 34, 35, 36 and 37 (125 facilities). The distribution of the logs of the emissions was found to have a mean of 0.70 ($\bar{x}$), a standard deviation of 0.75 (S) and a sample coefficient of skew of -0.076 (C_s). A coefficient of skew of 0 is a perfect log normal distribution. The relatively high standard deviation is due to the high variability of emissions data which caused some difficulties in data analysis.

A Student T test was performed on the logs of emissions for SIC categories 34, 35, 36 and 37. The Lower (L) and Upper (U) bounds of 90 and 50 percent confidence intervals were calculated using the following equation:

$$L, U = \bar{x} \pm S_{\bar{x}} t_{n-1;\ 1-\alpha/2}$$

where - $100 (1 - \alpha)$ is the confidence level in percent (e.g., for $\alpha = 0.1$ the confidence level is 90 percent.

- $t_{n-1;\ 1-\alpha/2}$ is found in a Student T distribution table.

- $\bar{x}$ is the sample mean.

- $S_{\bar{x}}$ is the sample deviation.

- n is the sample size.

The 90 percent confidence levels were calculated using the following parameters:

$n = 125$

$\bar{x} = 0.70$

$S_{\bar{x}} = 0.75$

$\alpha = 0.1$

$t_{n-1;\ 1\alpha/2} = t_{120,\ 0.95} = 1.658$

$L, U = 0.70 \pm (0.75)(1.658)$

$L, U = -0.54, 1.94$

antilog L, U = 0.29, 87 tons/yr/facility

The 50 percent confidence levels were calculated using the same n, $\bar{x}$ and $S_{\bar{x}}$. However α was set at 0.50 and t as follows:

$$t_{n-1;\ 1-\alpha/2} = t_{120,0.75} = 0.677$$

$$L,U = 0.70 \pm (0.75)(0.677)$$

$$L,U = 0.19,\ 1.21$$

Antilog L,U = 1.5, 16 tons/yr/facility

Once again the wide intervals calculated are a result of the high variability in the emissions data.

Another source of variability in the data is the projection factors for percent of facilities operating solvent cleaning equipment. For SIC categories 34, 35, 36 and 75, more than 50 facilities were contacted in each category. The projected percent of facilities is not likely to change by more than ± 15 percent even if all of the facilities which refused to answer operated solvent cleaning equipment. For SIC's 28, 30, 33, 37, 38 and 39, between 20 and 50 facilities were contacted in each SIC category. The percent of facilities projected to operate solvent cleaning equipment is also unlikely to vary by more than ± 15 percent, although the authors have slightly less confidence in these projections. For SIC's 22 and 25 larger sample sizes may show significantly different results.

GCA also attempted to validate pieces of equipment and emissions estimates with estimates from independent sources of information. GCA contacted six major manufacturers of solvent and solvent cleaning equipment. Only two companies responded with sufficiently detailed information to estimate emissions and equipment. Their responses are shown in Figures 4 and 5. These two companies alone service about 4,000 cold cleaners in Cook County, while GCA projects about 2,300 cold cleaners in Cook County.

Comparing Walden's projections of solvent cleaning emissions in Table 3 to GCA's projections in Table 14, the results are fairly similar. Walden projects about 32,000 tons/yr for all nine counties and GCA projects about 36,000 tons/yr. Calculations using CTG emission factors were not attempted because of the low projection of the numbers of pieces of equipment.

Even though GCA's estimate of pieces of solvent cleaning equipment appears to be too low, GCA does not anticipate changes in the percent of exempt equipment, if a higher number of equipment per facility projection factor were used. Consequently, the authors believe the percent difference in allowable emissions would not be strongly affected by a modification of the equipment per facility projection factors.

October 16, 1980

THM 80-166

Mr. Malcolm Petroccia
GCA Corporation
Technology Division
213 Burlington Road
Bedford, MA 01730

Dear Mr. Petroccia:

In response to your letter of September 26, 1980 (copy attached) the following information is submitted.

1) We have five sales branches in the Chicago area that service Cook County and some surrounding counties. On September 5, 1980 these five branches had 3,852 of our machines leased within Cook County and 3,919 machines in the surrounding counties for a total number of 7,771 leased machines. In addition to these leased machines, we also provide solvent for approximately 870 customer owned machines in the entire multi-county area.

2) For 12 months ending September 18, 1980, the difference between clean solvent used and spent solvent returned from the five branches totalled 349,840 gallons. That is an average of 40.5 gallons per machine per year or 0.120 metric ton/year.

3) The density of our solvent at ambient temperatures is 6.5 pounds per gallon.

4) Brochures are enclosed.

   a) Form No. 1001
   b) Form No. 1077
   c) Form No. 1000

Sincerely,

Ted Mueller

TED MUELLER
Technical Services

THM/keg

Enclosures

655 BIG TIMBER ROAD ELGIN, ILLINOIS 60120 PHONE 312/697-8460

Figure 4. Solvent manufacturer's response.

Baron·Blakeslee

REPLY TO:
2001 NORTH JANICE AVENUE
MELROSE PARK, ILLINOIS 60160
AREA CODE 312-450-3900
CABLE: BARBLAKE-MLPK
TELEX: 25-4701

October 28, 1980

GCA Corporation
Technology Division
213 Burlington Road
Bedford, MA 01730

Attention: Ms. Andrea M. Kiddie

Dear Ms. Kiddie,

Enclosed is a list of Solvent Vapor Degreasers and cold solvent units installed in the Cook County area in 1979. Attached to this list are catalog pages for each model.

We have also enclosed catalog pages of other models available, but not installed in Cook County area in 1979.

Since conveyorized vapor degreasers are custom-built for each application, we do not have catalog pages for them. The exception is the TH-LLV copy of which is included.

We have noted the few cold solvent units we make. Dimensions of stills have not been given as stills are always covered, evaporative losses are very small.

We hope this information is useful and are sorry to have taken so long.

Very truly yours,

Joseph Pokorny

Joseph Pokorny
BARON-BLAKESLEE
Division of Purex Corporation

JP:aw

Figure 5. Solvent manufacturer's response.

Baron·Blakeslee

SOLVENT CLEANING EQUIPMENT INSTALLED IN COOK COUNTY AREA IN 1979.

No. Units	Model	Evap. Area	M^2	Solvent	#/hr. est.
3	MSR-120	24"x14"	0.22	Freon 113	0.5
1	MSW-480	44"x28"	0.80	113/MeCl2	1.7-2.0
2	MLR-120	24"x14"	0.22	Freon 113	0.5
1	MLR-480	44"x28"	0.80	Freon 113	1.7-2.0
1	MLR-216	28"x22"	0.40	Freon 113	0.85-1.0
2	3LLV	82"x30"	1.587	TCE	1.7-5.0
* 1	DP4-2430	52"x28"	0.94	TCE	1.-10.
1	DP5-3030	64"x34"	1.40	TCE	1.5-10.
1	DP5-3042	64"x34"	1.40	TCE	1.5-10.
1	DP5-3042	64"x34"	1.40	1,1,1	1.5-10.
1	DP6-3636	76"x40"	1.96	TCE	2.-10.

* Solvent consumption of DP models idling to 2,000 # steel/hr. working.

No. Units	Stills	Covered	Solvent	#/hr. est.
4	MRW-60	-X-	Freon 113	0-0.1
2	MRR-10	-X-	Freon 113	0-0.05
1	HRS-60	-X-	1,1,1	0-.5
1	CVS-18 Flux Remover $1m^2$		1,1,1	5.0
1	CBS-430 C.B. Stripper $2.8m^2$		MeCl2	5-10.
1	OFH-18 Defluxer $0.74m^2$		Freon 113	5.
1	OFH-24 Defluxer $1.16m^2$		Freon 113	6-7.

Figure 5 (continued)

SECTION 5

CONCLUSIONS

This report provides data on solvent cleaning equipment and emissions for nine counties in two urban oxidant nonattainment areas. The object of this study was to provide sufficient data for a determination of equivalency between the RACT technically supported in U.S. EPA's Solvent Metal Cleaning CTG document and Illinois' Rule 205(k). Equivalency is defined by U.S. EPA as less than a 5 percent difference in allowable emissions under the two rules. The data contained in this report culminate in a comparison of allowable emissions in Table 25. These data indicate that allowable emissions under Illinois Rule 205(k) range from 8.2 percent less than emissions allowed by the CTG guidance to 2.6 percent more than emissions allowed by the CTG. This means that under one set of assumptions (low emissions, excellent compliance) the Illinois rule is more stringent than the CTG and under another set of assumptions (high emissions, poor compliance) the Illinois rule is slightly less stringent than the CTG.

APPENDIX A

DATA ANALYSIS PROCEDURES

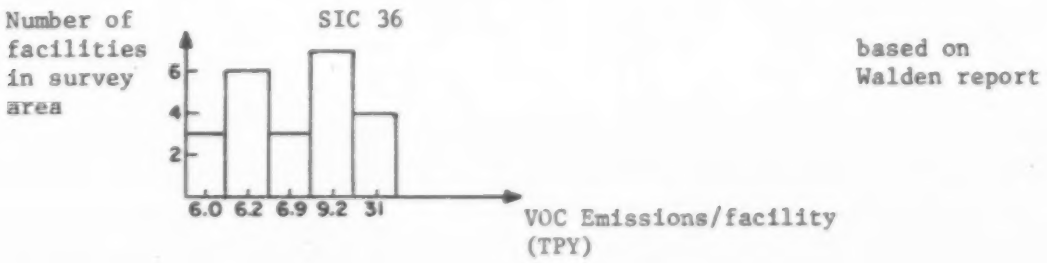
Two levels of adjustment need to be made to a list of facilities with known solvent cleaning operations in the survey area. The first level is to adjust emissions from these facilities due to updated information which may show a different size distribution than existed previously. The second level is to adjust the size distribution and sample population size based on a survey of sources not previously known to operate solvent cleaning equipment.

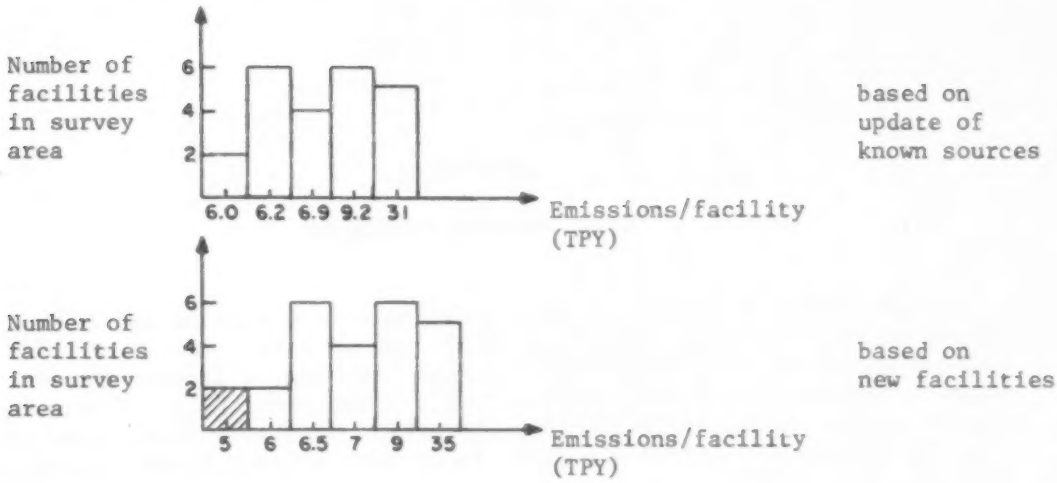
The Walden report provides VOC emissions from all operations within a facility. For each SIC category, the percent of total VOC emissions that is contributed by degreasing operations can be calculated from the data on Walden's Evaporative Hydrocarbon Questionaire. This calculation is expected to reduce the number of SIC categories from the 32 reported in the Walden Report to about 20 categories which are likely to have solvent cleaning operations.

The size distribution of facilities within each SIC category can be calculated from data in the Walden report. Updated information for the survey area will be used to modify the previous size distributions if they have changed. In addition to modifying the size distribution, the updated information will provide data on size and type of equipment used by facilities in each SIC category.

The second level of adjustment will account for sources not previously known to operate solvent cleaning equipment. For each SIC category, the new sources will be added to the known sources in the survey area creating a new size distribution and increasing the number of facilities in the survey area by a calculable percentage. This information would then be used to modify the population size distribution (all 9 counties) and to increase the total population by a calculated percentage.

An example SIC category is shown graphically to further explain the analysis method.





The example numbers shown in the graph represent known numbers of facilities in the survey area categorized under SIC code 36. In the first graph (previous page) there are 21 facilities with total VOC emissions from solvent cleaning calculated as follows:

$$3 \times 6.0 \text{ TPY} + 6 \times 6.2 \text{ TPY} + 3 \times 6.9 \text{ TPY} + 7 \times 9.2 \text{ TPY} + 4 \times 31 \text{ TPY} = 264.3 \text{ TPY}$$

The second graph indicates that these same facilities have increased their emissions based on updated information. The third graph shows that 2 new faciilties were found emitting an average of 5 TPY each. The 2 new sources represent about a 10 percent increase over the 21 sources found previously. The number of facilities in each county would be adjusted accordingly. The total VOC emissions from solvent cleaning are recalculated for the third graph.

$$2 \times 5 + 2 \times 6 + 6 \times 6.5 + 7 \times 4 + 9 \times 6 + 5 \times 35 = 318 \text{ TPY}$$

The increase in emisisons in this example is about 20 % over data in the Walden report and each county's emissions for SIC 36 would be adjusted accordingly.

When solvent consumption data is not available CTG emission factors will be used. Emission reductions will be calculated using both the poor and excellent compliance emission reduction factors given in the CTG. The data anlaysis phase will be completed by filling in the tables whose heading are shown below.